Arithmetic Exercises

ARITHMETIC EXERCISES

FOR FOURTH BOOK CLASSES,

BY

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Price, 15 cents ; Teachers' Edition, with Answers. 20 cents

PREFACE.

The authors of this series of Arithmetic "School Helps" offer no apology to the school public for the placing of their books as candidates for popular favor. The several numbers of the series are prepared by teachers actively engaged in the busy work of the schoolroom, and as teachers they know the great difficulty that the average teacher encounters in the presentation of new and crisp problems for his Arithmetic classes.

The authors would most respectfully request a consideration of the following points in connection with their series :—

I. Mechanical Work. After pupils have passed the Second Reader the usual text books provide but very scanty practice in the mechanical operations. Pupils instead of becoming swifter and more accurate as they advance in years frequently lose the speed and accuracy which they had acquired in the lower forms. To meet this difficulty the present series provides over 5,000 operations in mechanical work, which the teacher will find tested for him without the labor (and loss of time) of performing the work himself. This feature alone should commend the present series to every teacher of the subject.

II. No Answers. In the Pupils' Edition no answers are provided ; the Teachers' Edition alone contains the answers.

III. Saving in Time. The time of the teacher is too valuable to be taken up in the dictation of problems to a class, when for a mere trifle each pupil may be provided with a set of exercises for himself.

IV. **Writing.** The possession of these exercises by the scholars will tend to preserve his handwriting—it prevents the mad rush in copying questions from dictation.

V. **Understanding of Terms.** Without giving formal definitions of terms, problems are specially constructed to fix in the pupil's mind a thorough understanding of the technical terms of Arithmetic.

VI. **New Problems.** The great majority of the problems of the series have been written specially for these "School Helps." They are not simply a re-arrangement of old, stereotyped problems.

VII. **Problems Grouped.** The problems are not arranged in the ordinary "hit and miss" fashion, but are grouped according to types, and carefully graduated in degree of difficulty.

VIII. **Time Tests.** The purely mechanical operations of addition, subtraction, etc., are intended to be done at a pupil's best speed, a specified time being allowed as the teacher's experience finds suited to the ability of his class.

IX. **Book of Exercises.** This series is not in any sense designed to displace either the teacher or the authorized text. There is no attempt to show how to teach ; this is taken for granted. It merely furnishes ready to the teacher's hand bright, crisp, new problems with which to enforce his teaching.

THE AUTHORS.

Toronto, August, 1897.

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ORS.

Arithmetic for Fourth Book Classes.

I.—INFORMATION.

$1 = 10 dimes = 100 cents = 1000 mills. Contains 23⅓ grains pure gold.

1 mile = 5280 feet = 1760 yards = 320 rods.

1 nautical mile = 6086 feet = 1 knot, used in navigation.

1 fathom = 6 ft.   1 metre = 39.37 inches.

1 hand, used in measuring horses = 4 inches.

1 surveyor's chain = 100 links = 22 yards = 4 rods.

1 surveyor's link = 7.92 inches.

10 square chains = 1 acre = 4840 square yards.

1 square mile = 640 acres = 1 section (unit of land in Manitoba and the Territories).

1 "square" = 100 square feet, used in shingling.

1 lb. Troy = 5760 grains.

1 lb. Avoir. = 7000 grains.

1 ton = 2000 lbs.   Also called "short ton."

1 English ton = 20 cwts. of 112 lbs. each = 2240 lbs.

1 long ton = 2240 lbs., and is used to weigh iron and coal at the pit's mouth.

1 quarter, used in England in measuring grain = 8 bushels.

1 cord wood or rough stone = 128 cubic feet.

1 cubic yard of earth is called a *load*. Carts are constructed to contain that quantity.

1 bushel = 8 gallons of 277.274 cubic inches = 2218.192 cubic inches ; 2218 cubic inches is generally given.

1 barrel = 31½ gallons. Barrels cannot be constructed to contain an exact number of cubic inches, and since the capacity varies the capacity of each is usually branded on the head.

1 hogshead (hhd.) = 2 bbls. = 63 gallons.

1 £ = 20 shillings = 240 pence.

1 crown = 5 shillings.   1 guinea = 21 shillings.

1 sovereign = 20 shillings.

1 shilling = 24⅓ cents ;   1 £ or 1 sovereign = $4.86⅔.

1 score = 20 ;   1 gross = 12 dozen.

Leap year 366 days ; occurs every fourth year, except those centuries which will not exactly contain 400, as 1700, 1800, 1900 ; but 1200, 1600, 2000 are leap years.

1 cental = 100 lbs., used in reporting Chicago Board of Trade grain returns.

1 ton Anthracite or hard coal = 28 bushels of 80 lbs. each = 2240 lbs. (demanded by City Engineer, Toronto).

1 stone = 14 lbs., used for weighing flour and meal.

1 barrel flour = 14 stone = 196 lbs.

1 barrel beef = 200 lbs. ;   1 barrel salt = 280 lbs.

The following shows the number of pounds demanded for a *legal* bushel :

14 lbs. blue grass seed.

34 " oats.

36 " malt

40 " castor beans.

44 " hemp seed.

48 " barley, buckwheat or timothy seed.

50 " flax seed.

56 " Indian corn or rye.

60 " beans (white), beets, carrots, parsnips, peas, potatoes, red clover, onions, turnips, or wheat.

70 lbs. Bituminous or soft coal.

1 gallon *pure* water at 62° weighs 10 lbs.

1 cubic foot of pure water contains 1000 ozs. = 62½ lbs.

II.—PRELIMINARY EXERCISE.

(1) In a trial trip a torpedo boat made 33 knots in an hour.   Express this in statute miles.

(2) A ship's sounding line registered 6748 fathoms. Express this in miles, rods, etc.

(3) Bought 1000 tons coal at $3.50 per long ton, and sold at $5.25 per short ton. Find my gain.

(4) A race horse was sold for 455 guineas, and payment was made in an equal number of £10 notes, sovereigns, crowns, and half-crowns. Find the number of each.

(5) Express 4 miles, 151 rods, 3 yards, 1 foot, 6 inches in metres.

(6) A surveyor's book showed the dimensions of a rectangular township to be 560 chains by 480 chains. Find the area in acres.

(7) A pile of stone 36 feet long, 16 feet wide, and 4 feet high is broken at $2.50 per cord. Find the bill.

(8) A commission merchant sold 124 cheeses averaging 48 lbs., at 9¼d. per lb. Find the value of the sale in Canadian currency.

(9) Wheat is quoted in Liverpool at 24 shillings per quarter. Find the price per bushel in cents.

(10) A provision merchant bought flour @ $4.96 per barrel, and sold it retail at 45 cents per stone. Find the gain on a sale of 15 barrels.

III.—PRELIMINARY EXERCISE.

(1) Freight was charged at the rate of 21 cents per cwt. on beef and salt. Of two merchants, one bought 40 bbls. salt, and the other 40 bbls. beef. Find the difference in their freight bills.

(2) A bin of soft coal contains 3327 cubic feet. Find its value at $3.50 per ton of 2000 lbs.

(3) 168 bushels of oats worth 21 cents per bushel are exchanged for an equal weight of rye worth 43 cents per bushel, the balance to be paid in cash. Find that balance.

(4) A druggist buys quinine at $3.50 per pound Avoir. and sells it for $0.72 per oz. Troy. Find his gain on a purchase of 4 lbs.

(5) What is the least distance which can be exactly measured when we use the yard, the rod, the fathom, the chain, as the units of measurement ?

(6) What is the least sum in Canadian currency which can be exactly measured, using guineas, sovereigns, crowns, half-crowns, and shillings as the units?

(7) One day's operations on the Chicago wheat exchange amounted to 240492 centals. Express this in bushels.

(8) What price per cental is equivalent to 54 cents per bushel?

(9) Find the number of barrels in a circular cistern of 4′ 8″ diameter and 83.1822 inches deep. (1 gallon = 277 274 cubic inches).

(10) A water-works coal shed in Toronto is 125′ × 112′ and the coal is 23.10416 feet high. If it be filled with Anthracite coal @ $3.25 per ton, find the bill charged to the City of Toronto.

TIME TESTS IN ADDITION—SHEET I.

Third Book Scholars should aim to do each of these additions in 1¼ minutes, and Fourth and Fifth Book Scholars in 1 minute. Take, say, not more than 1 or 2 at any one time.

(1)	(2)	(3)	(4)	(5)	(6)
57986	68795	76859	89765	65789	59678
79865	86795	68597	97658	57896	96785
98657	67958	85976	76589	78965	67859
86579	79586	59768	65897	89657	78596
65798	95867	97685	58976	96578	85967
57986	58679	76859	89765	65789	59678
79865	86795	68597	97658	57896	96785
98657	67958	85976	76589	78965	67859
86579	79586	59768	65897	89657	78596
65798	95867	97685	58976	96578	85967
57986	58679	76859	89765	65789	59678
79865	86795	68597	97658	57896	96785

(7)	(8)	(9)	(10)	(11)	(12)
98675	86759	67598	75986	59867	57689
86759	67598	75986	59867	98675	76895
67598	75986	59867	98675	86759	68957
75986	59867	98675	86759	67598	89576
59867	98675	86759	67598	75986	95768
98675	86759	67598	75986	59867	57689
86759	67598	75986	59867	98675	76895
67598	75986	59867	98675	86759	68957
75986	59867	98675	86759	67598	89576
59867	98675	86759	67598	75986	95768
98675	86759	67598	75986	59867	57689
86759	67598	75986	59867	98675	76895

(13)	(14)	(15)	(16)	(17)	(18)
76895	68957	89576	95768	86579	65798
68957	89576	95768	57689	65798	57986
89576	95768	57689	76895	57986	79865
95768	57689	76895	68957	79865	98657
57689	76895	68957	89576	98657	86579
76895	68957	89576	95768	86579	65798
68957	89576	95768	57689	65798	57986
89576	95768	57689	76895	57986	79865
95768	57689	76895	68957	79865	98657
57689	76895	68957	89576	98657	86579
76895	68957	89576	95768	86579	65798
68957	89576	95768	57689	65798	57986

IV.—L.C.M. AND G.C.M.

Find the L.C.M. of :
(1) All the **prime** numbers between 11 and 29 inclusive.
(2) $11\frac{1}{3}$, $14\frac{1}{2}$, $18\frac{8}{9}$, $19\frac{5}{8}$.
(3) 37, 43, 111, 129, 185, 215.

(4) 5 guineas, 7½ sovereigns, 5 crowns, 8 half-crowns, 5 shillings.

(5) 5 oz. Troy.   8 oz. Avoir.   4 drams. Apothecaries.
Find the G.C.M. of :

(6) 21087 and 10989.

(7) 41829 and 16617.

(8) 2193, 2967, and 3999.

(9) $16.25, $21.25, and $28.75.

(10) 1507 yds.; 2 miles, 1549 yds.; and 3 miles, 111 rods, ½ yd.

V.—L.C.M. AND G.C.M.

(1) What length of board would make fencing for fields having sides 221 ft., 299 ft., 611 ft., 1261 ft., or 741 ft., without waste ?

(2) What is the least sum of money with which I could buy horses at $120, oxen at $84, cows at $36, or sheep at $18 ?

(3) What number will divide 153 and 566, leaving as remainders 10 and 7 respectively ?

(4) A lady desires to purchase cloth which may be cut into lengths of 5, 6, 7, and 8 yards, without any waste. What is the least number of yards which she can purchase ?

(5) What must be the least length of a box which will contain blocks 4 in , 6 in., 8 in., or 10 in. long, without loss of space ?

(6) What is the least sum of money with which I can purchase horses at $154⅞, oxen at $102⅔, cows at $45, or sheep at $21⅘ ?

(7) What is the least number which may be divided by each of the following numbers and leave a remainder of 27 in each case :—36, 72, 108, 144, and 180 ?

(8) A merchant has three portions of flour, containing respectively 1457 lbs., 2491 lbs., and 3337 lbs.   He has only one size of bag above 1 lb., which might be used in putting up the three lots of flour without leaving any over.   What weight of flour will the bag contain ?

(9) A certain number will divide 17167 and 23032, leaving as remainders 104 and 93 respectively. Find the number.

(10) A rectangular yard is paved with square granite blocks. The yard is 23 yds., 1 ft., 7 in. wide and 24 yds., 2 ft., 3 in. long. Find a side of the largest block possible to use.

VI.—L.C.M. and G.C.M.

(1) I was told to find what number would divide 151, 403 and 562, leaving as remainders 8, 12 and 11 respectively. I could not find such a number. Can you? If you cannot, explain why.

(2) A, B, and C walk together and take steps of 27 inches, 29 inches and 31 inches. How many times will all three step at the same instant in a walk of 4 miles, 313 rods, 3 yds., 2 ft., 3 in.?

(3) 15120 is the L.C.M. of 12, 18, 36, 48, 54, 60, and another number prime to them. What is that number?

(4) The product of three numbers is 66096. One-half of one of the numbers multiplied by one-third of the second is 153. Find the third number?

(5) Three numbers between 40 and 170 have 15 for their H.C.F. and 3465 for their L.C.M. Find the numbers.

(6) The G.C.M. of two numbers is 93, the L.C.M. is 3255. Find the numbers.

(7) What is the least number that, when divided by 217, 341, 403 or 527, will give 27 as remainder in each case?

(8) By what number must 1999 be divided that the quotient and the remainder may be the same as the quotient and remainder in the division of 109 by 11?

(9) Find the least numbers which taken from 893 and 967 respectively, leave remainders of which 7 is a measure.

(10) Box A contains 22 bush., 3 pks.; box B contains 26 bush.; box C contains 29 bush., 1 pk.; box D contains 32 bush., 2 pks. How many pecks would the largest sack hold which would exactly measure the contents of any of the four boxes?

TIME TESTS IN ADDITION.

(1)	(2)	(3)	(4)	(5)	(6)
79865	98657	95768	57689	69587	95876
98657	86579	57689	76895	95876	58769
86579	65798	76895	68957	58769	87695
65798	57986	68957	89576	87695	76958
57986	79865	89576	95768	76958	69587
79865	98657	95768	57689	69587	95876
98657	86579	57689	76895	95876	58769
86579	65798	76895	68957	58769	87695
65798	57986	68957	89576	87695	76958
57986	79865	89576	95768	76958	69587
79865	98657	95768	57689	69587	95876
98657	86579	57689	69587	95876	58769

(7)	(8)	(9)	(10)	(11)	(12)
58769	87695	76958	96785	67859	78596
87695	76958	69587	67859	78596	85967
76958	69587	95876	78596	85967	59678
69587	95876	58769	85967	59678	96785
95876	58769	87695	59678	96785	67859
58769	87695	76958	96785	67859	78596
87695	76958	69587	67859	78596	85967
76958	69587	95876	78596	85967	59678
69587	95876	58769	85967	59678	96785
95876	58769	87695	59678	96785	67859
58769	87695	76958	96785	67859	78596
87695	76958	69587	67859	78596	85967

(13)	(14)	(15)	(16)	(17)	(18)
85967	59679	96795	67959	79596	95967
59678	96795	67959	79596	95967	59679
96785	67959	79596	95967	59679	96795
67859	79596	95967	59679	96795	67959
78596	95967	59679	96795	67959	79596
85967	59679	96795	67959	79596	95967
59678	96795	67959	79596	95967	59679
96785	67959	79596	95967	59679	96795
67859	79596	95967	59679	96795	67959
78596	95967	59679	96795	67959	79596
85967	59679	96795	67959	79596	95967
59678	96795	67958	79596	95967	59679

(6)
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(12)
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95967
59679

VII.—MEASURES.

(1) A battle-ship under trial steamed 22 nautical miles (6086 ft.) in an hour. Find her rate in statute miles.

(2) Find the cost of wire necessary for fencing both sides of a railroad 50 miles long, 6 strands high, at 4 cents per lb.—1 rod of single strand wire weighs 1 lb.

(3) Ice expands $\frac{1}{10}$ in freezing, and a cubic foot of water weighs 1000 oz. Find the weight of the ice on a pond 242 ft. × 384 ft. and 9 in. thick.

(4) A bar of iron 1 inch square and a foot long weighs 3½ lbs. Find the weight of a piece 8 ft. long and 1½″ × 1½″.

(5) From Wingham to Clinton, a distance of 24 miles, the Huron County Council let a contract for gravelling the roadway, 12 ft. wide, and 9 in. deep, at 15 cents per cubic yard. Find the contractor's bill.

(6) A boy takes 1320 30-inch steps in going round a rectangular field 220 yards wide. Find the area.

(7) Find the cost of digging a cellar 27′ × 36′ and 7½′ deep at 35 cents per cubic yard.

(8) A grazing farm of 259 rods × 407 rods is divided into square fields of the largest possible size. How many fields?

(9) A man sows 2 lbs. timothy seed on every 121 sq. yds. of his ground. At $5 per bushel find the cost of seeding 10 acres.

(10) 1 lb. thread made 3 yds. cloth 27″ wide. Find quantity needed to make 15 yds., 45″ wide.

VIII.—MEASURES.

(1) A man sows 12 oz. wheat on a sq. rod of his farm. How many bushels would a Manitoba farmer require to seed a section?

(2) From a patch of oats 1 yard square, there was harvested 1 quart. What rate per acre is this?

(3) Bought sugar for $65.00 per ton and sold it at the rate of 7 lbs. for 33¼ cents. Find gain per ton.

(4) For every 3 oz. of green tea in a mixture of 24 lbs. there are 5 oz. of black. Find the number of lbs. of each.

(5) Bought 37 tons, 15 cwt. bran for $377.50, and sold it at 75 cents per cwt. Find gain.

(6) A grocer sold four lots of tea weighing respective. , 6 cwt., 39 lbs., 13 oz. ; 6 cwt., 64 lbs., 15 oz. ; 13 cwt., 93 lbs., 7 oz. ; and 7 cwt., 94 lbs., 11 oz. Find the weight of the tea sold.

(7) 1869 sovereigns are coined from 40 lbs. Troy of gold. How many could be coined from 40 lbs. Avoir.?

(8) What fraction of 4 lbs., 1 oz., 8 dwts., 15 grs. is 1 lb., 1 oz., 9 dwts., 15 grs. ?

(9) Express 1 oz. Troy as the decimal of 1 lb. Avoir.

(10) Bought at the rate of $2.00 per oz. Troy, at what price per lb. Avoir. must I sell to just recover value expended ?

IX.—MEASURES.

(1) Find the cost of oats for 12 horses, 8 weeks, if 3 times per day they are each fed ½ gallon, which costs 25 cents per bushel.

(2) Exchanged 40 pks. clover seed worth $4 per bush. for manure at 60 cents per cwt. How much manure was purchased ?

(3) Which is the cheaper, wheat at 58 cents per bush., or at 96 cents per cental ; and what would be the difference in buying wheat enough to seed 12 acres, allowing 2 bushels, 40 lbs. to an acre ?

(4) 3 lbs. wheat makes 2 lbs. flour. How many barrels of flour can be made from 147 bushels of wheat ?

(5) A bin is 12′ × 11′, 6⅝″ and 6′ deep. Find the value of the wheat it will contain at 60 cents per bushel.

(6) A dealer sells to five customers respectively, 4 gals., 3 qts., 1 pt. ; 3 gals., 1 qt., 1 pt. ; 10 gals., 3 qts., 1 pt. ; 14 gals., 1 qt., 1 pt. ; 7 gals., 1 qt., 1 pt. of maple syrup. Find the amount of the sale.

(7) A water tank 10 ft. × 6 ft. contains 3000 gallons. Find the depth of the water. (1 cubic ft. = 62½ lbs.)

(8) A liquor dealer has an equal number of half-pint, pint, and quart bottles which he exactly fills from a barrel of wine. How many bottles of each kind has he?

(9) A hhd. of brandy costs $220.50. Find the selling price of a 5-gallon cask to gain ¾ of its cost.

(10) Find the quantity of water added to a barrel of $4.20 brandy so that when sold for $4.41 per gallon there may be a gain of ¼ of cost.

X.—MEASURES.

NOTE.—For the greater part of this exercise we desire to make due acknowledgment to the "Canadian Teacher" of April 15, 1897. Calculate answers to nearest cent.

(1) What is 2896 lbs. of wheat worth at 78 cents per bushel?

(2) A farmer sold 6859 lbs. barley for 43 cents per bushel. How much was received for it?

(3) Exchanged 1726 lbs. wheat worth 81 cents per bushel, for 2584 lbs. oats at 37 cents per bushel, the balance to be paid in cash. Find cash paid.

(4) A gardener sowed 1½ acres with onions, and weighed the crop off one sq. rod, and found it yielded 93 lbs. What was the whole crop worth @ $1.25 per bushel, if each sq. rod yielded as much as this one?

(5) Find the total value of 1650 lbs. Indian corn @ 44 cents per bushel, 1368 lbs. peas @ 58 cents per bushel, 1924 lbs. buckwheat @ 61 cents per bushel, 743 lbs. timothy seed @ $4.30 per bushel.

(6) The following crop was taken off a field of potatoes, the wagon and its contents being weighed for each load: 1st load, 2146 lbs.; 2nd load, 1963 lbs.; 3rd load, 2345 lbs.; 4th load, 1874 lbs.; 5th load, 2740 lbs. The wagon weighed 739 lbs. What was the crop worth at 38 cents per bushel?

(7) ⅞ of a lb. of rye was sowed on each sq. rod of a 10-acre field. The total yield was 16800 lbs. Find the profit on the field allowing $20 for labour and marketing, when rye sells for 42 cents per bushel.

(8) How many lbs. of flax seed worth $1.50 per bushel will pay for 6528 lbs. of oats at 25 cents per bushel?

(9) On a field 120 yards by 242 yards there was raised 27 tons, 720 lbs. of carrots which sold for 15 cents per bushel. At the same rate find the value of a similar crop on a 100-acre farm.

(10) Find what weight would exactly measure 28 bushels of oats, 42 bushels of barley, and 70 bushels of hemp seed.

XI.—MEASURES.

(1) By how much does 7 hrs., 14 min., 26 sec. exceed 25 min.?

(2) By what was 3 weeks, 6 days, 23 hrs., 15 min., 20 sec. multiplied to give 39 weeks, 6 days, 16 hrs., 33 min., 20 sec.?

(3) ⅔ of the time from noon till now is 1⅓ times the time from now to midnight. What is the present time?

(4) A boy resolves that each day he will go to his studies 20 min. earlier, and will remain 20 min. later. Allowing 44 school weeks to a year, how much time does he gain in his High School course of 5 years, counting 6 study days in each week during the school term?

(5) Reduce ⅚ of a day to the decimal of ½ of a week.

(6) A watch which gains 90 seconds every 16 hours is correct on Monday noon. What is the time indicated by the watch at noon on the following Monday?

(7) A clock ticks 4 times in 3 seconds, and the distance round the dial plate is 36 inches. How far does the minute hand travel round this circle while the clock ticks 3200 times?

(8) Sold eggs for 30 cents per score when they cost 15 cents per dozen. On a certain day the sales amount to $45. How much of this is profit?

(9) Find the value of 1078 lbs. of granulated meal at 49 cents per stone.

(10) Steel pens cost 30 cents per gross, and are sold at the rate of 3 for two cents. Find the rate of profit.

XII.—MEASURES.

(1) How many acres in 169361280 square inches?

(2) A farm is cropped as follows :—Peas, 27 acres, 1 rood, 36 sq. rods, 5 sq. yds.; oats, 23 acres, 3 roods, 15 sq. rods, 3 sq. yds.; wheat, 63 acres, 2 roods, 27 sq. yds.; barley, 24 acres, 3 roods, 39 sq. rods, 25 sq. yds.; pasture, 37 acres, 1 rood, 24 sq. rods, 18 sq. yds. Find the area of the farm.

(3) A boy made a journey of 2 miles, 136 rods, 5 yds., 1 ft, 4 in., 11 times. Find the distance covered, and prove the correctness of your result.

(4) Find the value in ounces of $3\frac{1}{8}$ tons $+ 17\frac{3}{4}$ cwts. $+ 26\frac{1}{4}$ lbs. $+ 1\frac{1}{12}$ ozs.

(5) A shipment of cheese was sold in London for £324 16s. 8d. Find the value of the draft purchased in Canadian money if exchange costs $2.25.

(6) If the pennyweight contained 22.5 grs. Troy instead of 24, find the number of grains which would make 1 lb. Avoir.

(7) In $\frac{3}{14}$ yr. $+ \frac{5}{42}$ week $+ \frac{3}{8}$ day $+ \frac{8}{15}$ hour how many seconds?

(8) In a potato field there are 160 rows of 320 hills to a row, which average 12 potatoes to a hill, 36 of which fill a peck measure. Find the value of the crop at 27 cents per bushel.

(9) $64.26 is the proceeds at 17 cents per lb. of the butter made in one week from the milk of 24 cows. Given that 37 quarts of milk make 4½ lbs. of butter, find the average daily milking of each cow.

(10) Find the amount of the following bill :—13 reams, 10 quires foolscap at 2 cents for 5 sheets ; 720 pens at 54 cents per gross ; 12 doz. lemons at 16 for 25 cents ; 15 doz. eggs at 21 cents per score ; $13\frac{29}{175}$ ozs. (Avoir.) of arnica at 15 cents per oz. Troy.

XIII.—MEASURES.

(1) An American liner steamed 18 nautical miles (6086 feet) in an hour. Find in statute miles how far she travels in 5 days.

(2) Find the cost of the wire necessary for fencing both sides of a railroad 50 miles long, 8 strands high, at 5 cents per lb., if 4 rods of wire weigh 5 lbs.

(3) Which is cheaper goods 27 inches wide worth 90 cents per yard, or goods 1¼ yards wide costing $1.40? Find the difference in the cost of carpeting a room 12 feet × 18 feet with carpet as described above, the carpet running lengthwise.

(4) 12 barley grains laid side by side make 1 inch and they are ¼ of an inch in length. If 2400 of them fill a pint measure, find the quantity which would cover one acre.

(5) Find the value of the turnips grown on a 10-acre field at 10 cents per bushel, if on a patch 22 yards square there was grown 1 ton, 16 cwt.

(6) Ice expands $\frac{1}{10}$ in freezing, and a cubic foot of water weighs 1000 ozs. Find the weight of the ice on a pond 242 ft. by 384 ft. and 9 inches thick.

(7) Find the cost of digging a cellar 54 ft. by 36 ft. and 7½ ft. deep, at 35 cents per cubic yard.

(8) A bar of iron an inch square and a foot long weighs 4½ lbs. Find the weight of a piece 8 ft. long and having an end 2½″ × 2½″.

(9) The G.T.R. ran the full length of a man's farm 1¼ miles and took a strip 4 rods wide, for which it paid at the rate of $150 per acre. How much did it pay him?

(10) Find the G.C.M. of 14 inches; 6 ft., 5 inches; 21 yds., 2 ft., 11 inches; 2 rods, 3 yds., 7 inches.

XIV.—MEASURES.

(1) The fore-wheel of a carriage is 7′ in circumference and makes 792 more revolutions than the hind wheel in a trip of 3½ miles. Find the circumference and the diameter of the hind wheel.

(2) I set my watch at noon on Saturday, and at 10.30 a.m. on Monday it ha gained 3½ minutes. What will be the real time on Tuesday when my watch is at 3.30 p.m.?

(3) The product of the 1st and 2nd of three prime numbers is 377, of the 2nd and 3rd is 481. Find the numbers.

(4) By what factor will the number of ounces in 1 ton, 19 cwt., 2 qrs., 3 lbs., 8 oz., require to be multiplied to give a product equal to the number of inches in 12 miles, 7 fur., 33 rods, 2 ft., 10 inches.

(5) Seven trucks of coal weigh 31 tons, 3 cwt., 3 qrs., 6 lbs.; two of them weigh 7 tons, 17 cwt., 2 qrs., 18½ lbs. Find the average weight of each of the others.

(6) A boy rolls his hoop, the circumference of which is 5 ft. 6 in., a distance of 1¾ miles. How many times did it turn?

(7) The town of Wingham let the contract for granolithic walks 8 ft. wide on both sides of a street, ¾ of a mile long, at 10¾ cents per square foot. Find the contract price, allowing for kerbing at 75 cents per linear yard, and six street intersections, each 45 ft. wide.

(8) The "Daily Mail and Empire" publishes a daily edition averaging 12 pages of 18 in. by 24 in. Find the area covered by a yearly edition of 313 issues, if the average daily issue be 24200 copies.

(9) A roadway 35 ft. wide is made directly through the middle of a square field of 140 yards side. What fraction of the field was taken for the road?

(10) Quebec City, Canada, and Valparaiso, Chili, are situated on the same meridian line, but the latitude of the former is 46°, 45 mins. north, while that of the latter is 32°, 45 mins. south. Find the distance they lie from each other measured along the same meridian line, if a degree of latitude measure 69 miles, 60 rods, 4 yards.

(1)	(2)	(3)	(4)	(5)	(6)
98758	87589	75898	58987	89875	87967
87589	75898	58987	89875	98758	79678
75898	58987	89875	98758	87589	96787
58987	89875	98758	87589	75898	67879
89875	98758	87589	75898	58987	78796
98758	87589	75898	58987	89875	87967
87589	75898	58987	89875	98758	79678
75898	58987	89875	98758	87589	96787
58987	89875	98758	87589	75898	67879
89875	98758	87589	75898	58987	78796
98758	87589	75898	58987	89875	87967
87589	75898	58987	89875	98758	79678

(7)	(8)	(9)	(10)	(11)	(12)
79678	96787	67879	78796	96876	68769
96787	67879	78796	87967	68769	87696
67879	78796	87967	79678	87696	76968
78796	87967	79678	96787	76968	69687
87967	79678	96787	67879	69687	96876
79678	96787	67879	78796	96876	68769
96787	67879	78796	87967	68769	87696
67879	78796	87967	79678	87696	76968
78796	87967	79678	96787	76968	69687
87967	79678	96787	67879	69687	96876
79678	96787	67879	78796	96876	68769
96789	67879	78796	87967	68769	87696

(13)	(14)	(15)	(16)	(17)	(18)
87696	76968	69687	59857	98575	85759
76968	69687	96876	98575	85759	57598
69687	96876	68769	85759	57598	75985
96876	68769	87696	57598	75985	59857
68769	87696	76968	75985	59857	98575
87696	76968	69687	59857	98575	85759
76968	69687	96876	98575	85759	57598
69687	96876	68769	85759	57598	75985
96876	68769	87696	57598	75985	59857
68769	87696	76968	75985	59857	98575
87696	76968	69687	59857	98575	85759
76968	69687	96876	98575	85759	57598

(6)
87967
79678
96787
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78796
87967
79678
96787
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78796
87967
79578

(12)
68769
87696
76968
69687
96876
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87696
76968
69687
96876
68769
87696

(18)
85759
57598
75985
59857
98575
85759
57598
75985
59857
98575
85759
57598

XV.—FRACTIONAL PROBLEMS.

(1) The sum of three fractions is 1 49/100. One-half the least is 23/100, and one-third the largest is 44/100. Find the other fraction.

(2) I have 3/4 of an acre in one plot, 11/8 of an acre in a second, 11/4 of an acre in a third, and 4 1/2 acres in a fourth. Find the value @ $96.00 per acre.

(3) I exchanged 46 1/8 bushels of oats at 23 1/4 cents for wheat at 61 1/2 cents. Find how many bushels of wheat I bought.

(4) (a) $\dfrac{7 \times 3}{8 \times 3}$. (b) $\dfrac{7 \div 3}{8 \div 3}$. (c) $\dfrac{7 + 3}{8 + 3}$. (d) $\dfrac{7 - 3}{8 - 3}$.

Find how much each of the foregoing differs from 7/8, and write any rule which you might deduce from the results.

(5) Two men who are 79 7/8 miles apart travel till they meet, during which one has travelled 7 3/4 miles more than the other. Find the distance travelled by each.

(6) Reduce 3/8, 4/7, 5/8, 6/11, to fractions having a lowest common *denonimator*, and arrange in order of magnitude

(7) Reduce 3/8, 4/7, 5/8, 6/11, to fractions having lowest common *numerator*.

(8) After spending 3/8 of my money, then 1/5 of it, and lastly 1/2 of what now remains, I have $92.82. What had I at first?

(9) I spent $\dfrac{3\frac{1}{2}}{11}$ of my money and had then $1378.48 more than I spent. Find original sum.

(10) Find the value of 3/4 + 1 1/2 − (3/8 + 5/6) + 2 3/4 − (7/8 − 3/4).

XVI.—FRACTIONAL PROBLEMS.

(1) If 3/4 of the value of a house be $1575. Find the value of three such houses.

(2) 3/8 of the cost of a steamer is $18000. What should I pay for a 5/8 interest in the vessel?

(3) What should I pay for ⅚ of a field, if ⅜ of its cost were $480 ?

(4) If ⅝ of the cost of the fence round your school-yard were $35, find the cost of ⅗ of the fence.

(5) What is the value of ⅝ of a British Columbia gold mine, if ⅜ of it could be bought for $1872 ?

(6) If ⅔ of an insolvent estate be worth $3768, find the value of ⅞ of it.

(7) What should be given for ⁵⁄₁₁ of a farm if ⅝ of it sold for $7590 ?

(8) ⅔ of ⅔ of the cost of a house is $2472, find ⅝ of its value.

(9) ¾ of ⅞ of a load of gravel covers 14 square yards of walk, find number of loads needed to cover a yard, 48 yds. wide and 64 yds. long.

(10) ⅝ of 6⅔ times the cost of a factory is $33808. What is the factory worth ?

XVII.—FRACTIONAL PROBLEMS.

(1) I invest ¼ of my money in farm stock, ⅔ of it I paid for the farm, the remainder $900 I put in the bank. Find the price of the farm, and how much money I had at first?

(2) A boy spent $4.30 less than ⅓ of his money and had $10.45 left. How much money had he at first ?

(3) A man who owns ⅝ of a farm, sells ⅓ of his share for $4872. Find what I paid for ¼ of the farm.

(4) ⅖ of a piece of work can be done in 25 days, what part will be done in 37½ days ?

(5) ⅔ of a gross of pens cost 75 cents, find the cost of 5 dozen at that rate.

(6) How many words on 25 printed pages, if there were 350 on ⅝ of a page ?

(7) A boy spent ⅛ of his money, lost ¼ of the remainder, and had $2.73 left. How much had he at first?

(8) After spending $12 less than ⅔ of my money I had $3 more than ¼ of it left. Find the sum.

(9) Find the value of $\frac{2}{3}$ of $\frac{3}{4}$ of a cargo of tea, if a merchant who owns $\frac{5}{6}$ of it sells $\frac{3}{7}$ of $1\frac{4}{5}$ of his share for $728.75.

(10) After selling $\frac{4}{5}$ of $\frac{1}{3}$ of my land I have 42 acres more than $\frac{5}{18}$ of it remaining. Find the number of acres at first.

XVIII.—FRACTIONAL PROBLEMS.

(1) After spending $\frac{1}{10}$ of my money and $5 more, I have $1 less than $\frac{7}{8}$ of my money left. What was the original sum?

(2) What number diminished by $\frac{3}{8}$ of $\frac{10}{9}$ of itself, will leave as remainder 148?

(3) By selling $\frac{7}{8}$ of my turkeys for $693, I would receive 15 cents each less than by selling them for $787.50. Find the number of turkeys.

(4) I sell goods at an advance of $\frac{1}{4}$ of the cost, but for cash payment I throw off $\frac{1}{25}$ of the selling price. Find what fraction of cost represents the clear gain.

(5) A does $\frac{3}{8}$ of a piece of work, B does $\frac{3}{7}$ of it, C does $\frac{5}{21}$ of it, while D gets $14 for doing the remainder. Find the money paid A, B, and C.

(6) B gave away $\frac{3}{8}$ of his money less $4, then spent $2 more than $\frac{1}{2}$ of it, and had $20 left. Find the original sum.

(7) After subtracting $1\frac{1}{3}$ of $\frac{8}{33}$ of a number and 5 more, there still remains 128. What was $\frac{3}{8}$ of the number?

(8) $\frac{1}{3}$ of value of a house is equal to $\frac{1}{2}$ value of its contents, $\frac{1}{4}$ the difference of their values is $159. Find the values.

(9) $\frac{5}{6}$ of the cost of 4 lb. loaf is $5\frac{5}{6}$ cents, find the value of the 2 lb. loaf.

(10) $\frac{1}{6}$ of the value of a barrel of apples is worth $1.33, how many barrels will cost $191.52?

XIX.—REVIEW.

(1) $\frac{3}{4}$ the selling price of a piece of silk is equal to $\frac{4}{5}$ of the cost, find the advance on the cost at which it sold.

(2) Bought syrup at 80 cents per gallon, $\frac{1}{4}$ of it was lost through leakage. At what price per quart must I sell to gain $\frac{1}{4}$ of the outlay?

(3) A can do a piece of work in 6 days, B can do it in 8 days. Find the time for both together to do $\frac{2}{3}$ of it.

(4) Divide $275 among 3 persons, giving the first $2 for $3 given the second, and to the third $\frac{1}{2}$ more than to the other two.

(5) Two pipes feed a cistern which could fill it in 3 hours and 5 hours respectively, and a third which could empty it in $1\frac{1}{2}$ hours. If the cistern be full and all three pipes opened at once, in what time could it be emptied?

(6) $\frac{2\frac{1}{4}}{9}$ of a pole is painted blue, $\frac{2}{3}$ of the remainder is painted red, and the rest, 27 feet, is painted white. Find the length of the pole.

(7) From a bankrupt estate I receive $1.75 for every $4 owing to me, thereby losing $472.50. What was the debt?

(8) If 4 men *or* 6 women can do a work in 30 days, find the time required for 6 men *and* 4 women.

(9) A certain piece of work can be done by 20 men in 16 days; if after 5 days 9 men leave, how long will the remainder require to finish the work?

(10) Divide 1903 into two parts so that one may be $\frac{4}{5}$ of the other.

XX.—REVIEW.

(1) $774 is the money invested by three young men in a business, the first has $\frac{4}{7}$ of that invested by the second, while the third invests $5 for every $13 put in by the other two, find the investments of each.

(2) 12 men do $\frac{1}{3}$ of a work in 3 days, after 4 days they are joined by three others, how many days will the work still last?

(3) Sold a lot which cost me $900 gaining $\frac{1}{10}$ of selling price ; also second lot which cost me $600 gaining $\frac{1}{7}$ of the selling price. Find what fraction of my investment I gained.

(4) After spending $\frac{1}{7}$ of my money and $8 I had still left $1 more than $\frac{3}{4}$ of it. Find my money.

(5) A and B can do a piece of work in 6 days, B and C in 7 days, A and C in $6\frac{1}{2}$ days. Find the time when all work together.

(6) Divide $1736 among three brothers in the proportion of .7, .14, .28.

(7) I own $\frac{1}{3}$ of $\frac{5}{6}$ of a pleasure yacht and sell $\frac{1}{4}$ of my share for $55. What would be demanded for a half interest in the vessel?

(8) Bought an equal number of horses, cows and sheep, paying therefore $1360, the horses cost $113 each, the cows $47, and sheep $10. Find the number of each bought.

(9) I sold $\frac{1}{2}$ of my sheep, then exchanged $\frac{1}{3}$ of the flock, then $\frac{1}{15}$ of them died and the remainder, 15 sheep, were worried by dogs. How many in the flock?

(10) Sold lead pencils at 10 cents a dozen, which I paid 75 cents per gross for. At what advance on cost did I sell them?

XXI. —COMPLEX FRACTIONS.

The following complex fractions have appeared on the entrance papers during the past fifteen years.

(1) Simplify $(\frac{4}{5} \times \frac{9}{11} \times \frac{7}{50} \times \frac{57}{125}) \div 1\frac{4}{7}$ of $\frac{2}{3}$.

(2) Simplify $\frac{7}{47} (3\frac{1}{2} + 9\frac{3}{4}) \div \frac{4}{13}$ of $\dfrac{£15 \ 10s. \ 2d.}{16s. \ 2d.}$

(3) Simplify $\frac{1}{13}$ of $\frac{1}{3} + \dfrac{1}{\dfrac{\frac{1}{4}}{3 + \frac{1}{4}}}$.

(4) Simplify $\left(1\frac{3}{8} + \frac{5}{4} \text{ of } \frac{21}{11\frac{2}{3}} - \frac{6}{2\frac{1}{3}}\right) \div 2\frac{77}{114}$.

(5) What number divided by $\left(\frac{3}{17} + \frac{1}{13}\right) \div \left(3 - \frac{1}{3}\right) \times \left(\frac{1}{3} + \frac{1}{5}\right)$ will give $\frac{3}{14}$ of $\frac{4\frac{5}{6}}{6\frac{1}{5}}$ of $\frac{6\frac{8}{11}}{11\frac{5}{7}}$ of 247 ?

(6) Simplify $\dfrac{\frac{5}{6} \text{ of } \frac{3}{7}}{6\frac{1}{4} - 5\frac{4}{15}} \div \dfrac{\frac{8}{9} \times \frac{11}{12}}{\frac{7}{18} \times 5\frac{1}{4}}$.

(7) Simplify $\frac{1}{5}$ of $\frac{13}{15} - \dfrac{1\frac{8}{9}}{13\frac{1}{3}}$ of $\frac{18}{20} + \frac{9}{14}$ of $\dfrac{6\frac{4}{15}}{3\frac{2}{8}}$.

(8) Simplify $\dfrac{5\frac{1}{3} + 6\frac{3}{4}}{6\frac{3}{4} - 5\frac{1}{3}} + \frac{1}{2}\left(\frac{5}{8} + 3\frac{1}{2} - 1\frac{3}{4}\right) - \left(7\frac{1}{3} - 6\frac{5}{8}\right) - 9\frac{3}{8}\frac{2}{9}$.

(9) Simplify
$$\left\{\frac{\frac{3}{4} + \frac{5}{8} + \frac{7}{8} + 1\frac{1}{2}}{\frac{3}{4} - \frac{5}{8}} \times \frac{1}{39\frac{1}{2}}\right\} \div \left\{\frac{7\frac{1}{2}}{6\frac{1}{4}} + \frac{11\frac{1}{2} - 2\frac{4}{5}}{11\frac{1}{3} + 2\frac{4}{5}} \times 10\frac{9}{15} - 7\frac{1}{3}\right\}$$

(10) Simplify

$3\frac{1}{2}$

$3\frac{1}{4} \times \dfrac{\frac{1}{4} \text{ of } \frac{5}{8} \times 7\frac{1}{2}}{\frac{1}{3} + 4\frac{1}{2} \text{ of } \frac{3}{27}} + 7\frac{1}{3}\left(\dfrac{\frac{7}{8} - 1\frac{1}{8} + \frac{3\frac{3}{4}}{7\frac{1}{3}} + \frac{4}{15}}{\frac{7}{v3} + 150\frac{4}{15} - 74\frac{2}{3}}\right) \times 425.$

WEEKLY MAIL STATEMENT.

—	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Total
Ordinary lett'rs	9243	8564	9204	7695	7368	9986	
Registered let's	659	827	655	238	1346		
Post cards.....	2129	2214	1986	1873	989	399	
Book packets..	843	296	321	655	495	1655	
Parcels.......	257	328	201	199	276	378	
Newspapers...	11698	12325	14276	16883	17319	20205	
Total.....							

RELIGIOUS POPULATION OF A CITY.

—	Ward 1	Ward 2	Ward 3	Ward 4	Ward 5	Ward 6	Total
Episcopalian........	3872	2147	3879	1146	1527	948	
Presbyterian........	6321	1986	1895	1374	2496	1347	
Methodist..........	3239	2196	2749	1849	783	1148	
Baptist.............	926	2489	1986	3123	1095	875	
Roman Catholic.....	2149	1987	2786	974	874	1947	
Other Denominations.	867	326	874	726	589	843	
Total..........							

AGGREGATE ATTENDANCE AT A PUBLIC SCHOOL.

—	Jan.	Feb.	Mar.	April.	May.	June.	Total
Division 1..........	1040	1003	947	959	1087	1038	
" 2..........	1113	1098	1049	1118	1243	1193	
" 3..........	1214	1194	1136	1196	1253	1179	
" 4...........	1110	1201	1187	1208	1278	1257	
" 5..........	1224	1085	996	1096	1157	1195	
" 6..........	1316	1213	1179	1099	1196	1248	
" 7..........	1097	1109	1087	1153	1187	1235	
" 8..........	1243	1046	1058	1198	1249	1207	
Total							

XXII.—AREAS.

(1) Find the area of each of the following : (a) 3′ × 4′ (b) 15 rods × 20 rods. (c) 35 miles × 35 miles. (d) 4½ miles square.

(2) Find the area of each of the following : (a) 3 yards × 4 feet. (b) 16 rods × 5 feet. (c) 25 yards × 20 rods. (d) 2 miles × 200 rods.

(3) Find the area of each of the following : (a) 5 yds. × 4 ft., 6 in. (b) 10 rods, 5 yds. × 10 yds., 2 ft. (c) 3 miles, 200 r. s × 180 rods, 5 yds. (d) 3 miles, 200 yds. × 2 miles, 100 rods.

(4) Find the length when (a) Area = 1440 sq. yds.; width = 36 yds. (b) Area = 270 sq. yds.; width = 15 feet. (c) Area = 27225 sq. ft.; width = 6 rods, 11 ft. (d) Area = 8400 sq. yds.; width = 210 ft.

(5) Find the second dimension, given (a) Area = 10 acres ; width = 220 yds. (b) Area = ½ acre ; length = 165 ft. (c) Area = 8 acres ; width = 32 rods. (d) Area = 48400 sq. yds.; length = ½ mile.

The following is a somewhat common type of problem in areas : The area of a field whose sides are as 3 to 4 is 3 acres, 4680 sq. yds. Find the sides.

Area = 19200 sq. yds.   Area = 12 squares, per figure.
∴ Area of small sq. = $\frac{19200}{12}$ sq. yds. = 1600 sq. yds.

Divide 1600 into two equal factors by process of factoring.   Each equal factor is 40, a side of a small square, ∴ end of figure = 40 yds. × 3 = 120 yds., while side of figure = 40 yds. × 4 = 160 yds.

(6) The area of a field is 35 acres, and the length is to the width as 8 to 7.   Find the sides.

(7) A field of 8 acres has 4 times its length equal to 5 times its width.   Find its sides.

(8) Find the area of a field 30 rods × 40 rods.

(9) Find the area of a square field of 320 rods to a side.

(10) What is the area of a block of land 1 mile square?

XXIII — AREAS.

(1) What is the difference in acres between (a) 1 mile square and 1 square mile.   (b) 2 miles square and 2 square miles.   (c) 4 miles square and 4 square miles. (d) 6 miles square and 6 square miles.   (e) 9 miles square and 9 square miles?

(2) A boy walks at the rate of 3 miles per hour for 2 hours round a rectangular block of land twice as long as wide.   Find number of acres therein.

(3) Find the area of a similar block he would walk round in twice the time.

(4) How many town lots, each 4 rods × 5 rods, could be laid out in a block of land containing 24 acres, allowing ¼ of the block to be needed for streets?

(5) A rectangular farm cost $7800 at $65 per acre.   Its width being 600 yards, find its length.

(6) A sheet of glass 12 ft. long and 9 ft. wide is cut into panes 18 in. × 12 in.   How many panes are thus obtained, and what is the total distance in feet around them?

(7) The cost of a fence round a rectangular field 220 yards wide at 45 cents per rod, is $79.20.   Find area of field in acres.

(8) $102.50 is the cost at $⅝ per rod of a fence round a rectangular field 176 yards wide. Find the number of acres.

(9) Find the area to be plastered in a room 15 ft. × 18 ft., and 10 ft. high, allowing for 4 windows 6 ft. × 4 ft., 6 in., and 2 doors 4 ft. × 6 ft., 6 in.

(10) What will be the cost of stone flags to pave a court yard 210 ft. × 324 ft., the flags being 2 ft. 6 in. by 4 ft. 6 in., and worth 62½ cents each ?

XXIV.—PAPERING AND PLASTERING.

In this exercise the papering questions are solved by the following rule :—" Deduct half the areas of the openings in square feet from the area of the walls, also in square feet, and divide the remainder by 30. Take nearest whole number to denote number of rolls." The reason why all the area of openings is not deducted is because there is always waste in matching, etc., and why 30 and not 36 is used as divisor is that very few rolls of paper will run 24 feet or 8 yards, the length given in the Public School Arithmetic. 18 inches is the width for Canadian and American wall papers. The English width is 24 inches. The rule in quotation marks above is that given by one of the largest wall paper concerns in Canada. With 30-inch papers divide by 50 instead of 30. Why ?

Plasterers and painters deduct one-half the areas of the openings from the total area of the walls, and calculate the area to the nearest yard. We shall follow the same rule.

(1) Find the cost, at 15 cents per single roll, of the paper needed for a room 15' × 12', and 9' high, allowing for 2 doors 7' × 3½' and 3 windows 6½' × 3½'.

(2) Our school board decided to paper our school room with paper costing 30 cents per double roll. If the room be 24 ft. × 32 ft. and 12 ft. high, find the bill for the paper, allowing for 2 doors 4 ft. × 7½ ft., and 6 windows 4½ ft. × 9 ft.

(3) The managers' board of a local church decided to decorate the church auditorium. The room was 60 ft. × 40 ft. and 18 ft. high. There were 8 windows 8 ft × 14 ft., 2 doors 8 ft. × 6 ft., and 2 smaller doors 3½ ft. × 7 ft. The walls are covered with 30-inch ingrain paper worth 75 cents per roll, while the ceiling is covered with 30-inch paper costing 50 cents per roll. Find the bill for paper.

(4) A library 12 ft. × 18 ft. and 10 ft. high is decorated with paper costing 25 cents per single roll, both walls and ceiling. There is a border 14 in. deep, worth 15 cents per yard, at the top, and a base-board of 12 in. at the bottom. Find the bill, allowing the paper to go within 12 in. of ceiling, the border covering the rest, 2 doors 7½ ft. × 4 ft., and 3 windows 7 ft. × 4 ft.

(5) Find the cost of decorating a room 30 ft. × 42 ft. 16 ft. high The paper on the walls was 30-inch ingrain costing 75 cents per roll, the ceiling paper was 30-inches wide and cost 60 cents per roll. The border was 18 in. deep and cost 25 cents per yard. The labor cost 25 cents per roll for the paper, and the border 2 cents per yard—allow a saving of paper equal to full depth of the border, 4 doors 8 ft. × 6 ft., and 8 windows 6 ft. × 8 ft.

(6) Find the cost of plastering a room 20 ft. × 15 ft., and 10 ft. high, at 15 cents per square yard, allowing a base-board 1 ft. deep round the bottom, 2 doors 7½ ft. × 4 ft., and 4 windows 6 ft. × 4½ ft.

(7) Find the cost of plastering the walls of a room same as above, having only 1 door, 6 windows and no base board, at $.20 per square yard.

(8) Find the cost of plastering a room 18 ft. × 12 ft., 10 ft. high, base-board 12 in., 2 windows 6 ft. × 4½ ft., 1 door 7 ft. × 4 ft., at 18 cents per square yard, and of painting the ceiling when dry at 15 cents per square yard

(9) Find the cost of painting both the interior and the exterior of a rectangular box without a lid. The box is made of 2 in. material, and its external dimensions are 2 ft. 6 in. by 3 ft. 4 in., and 1 ft. 8 in. high, and the cost of the painting is $.00125 per square inch.

(10) The roof of a barn is 62 ft. × 25 ft. to each side. Find the cost of British Columbia shingles, each 4 in wide and laid 5 in. to the weather, the row at the eave being laid double, that would be necessary for such a barn, if the price were $2.40 per 1000 shingles?

XXV.—PLOWING, REAPING, ETC.

(1) A man turns a furrow of 9 in. How many miles will he walk in plowing a field 40 rods long and 20 rods wide?

(2) A land roller is 6 ft. wide. How far does a man drive who rolls a field 80 rods long and containing 12 acres?

(3) The knife of a reaper is 4 ft. 6 in. wide, and the horses walk three miles an hour. If the working day be from 7 a.m. to 6 p.m., with a 2 hour rest at noon, when will be finished the reaping of an 18 acre field?

(4) A lawn mower is 18 in. wide, and a man pushes it at the rate of 1¼ miles per hour. How much should he earn in a day of 10 hours, if paid $1.76 per acre?

(5) The plowman of No. 1 above walked 132 miles in plowing another field 40 rods wide. Find its length.

(6) Find the cost of fencing your field in No. 5 above at 35 cents per rod.

(7) Find the cost of wheat necessary to seed the above field (No. 5), at 90 cents per bushel, allowing 6 oz. grain to 11 square yards.

NOTE.—Combine all the requirements of 5, 6, and 7 above into one question.

(8) An electric sprinkler in Toronto sprinkled the street car track allowance of 12 ft. If the car runs an average of 6 hours per day, and at the average rate of 5½ miles per hour, find the area sprinkled during the months of June, July and August, allowing 13 Sundays in the quarter.

(9) In printing wall-paper the blank paper is wound round a large roller. The paper is being unwound at the rate of 6 miles an hour. If it be 18 in. wide, find the number of square yards of paper printed in a week of 6 days, the presses running 8 hours per day.

(10) A contractor in levelling a road drives his horses an average of 2 miles per hour for 8 hours. In that time he has levelled with his roller $15\frac{17}{33}$ acres. Find the width of the roller.

COMPLETE THE FOLLOWING SALES SHEET, HORIZONTALLY AND VERTICALLY:

Clerk.	Mon.	Tues.	Wed.	Thur.	Fri.	Sat.	Clerks' Totals.
	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	
A.B.......	28.79	34.71	35.33	30.10	27.97	47.81	
C.D.......	23.87	30.03	29.38	33.84	26.77	48.77	
E.F.......	16.99	27.09	28.77	30.16	24.95	43.07	
G.H.......	29.13	33.72	30.81	39.17	28.47	50.05	
J.K.......	18.47	32.29	26.73	34.45	28.88	54.39	
L.M.......	19.02	27.06	29.04	29.89	29.51	61.93	
Daily totals .							

Clerk.	Mon.	Tues.	Wed.	Thur.	Fri.	Sat.	Clerks' Totals.
	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	
A.B.......	95.65	89.24	59.79	78.04	59.37	98.16	
C.D.......	71.58	65.41	67.24	62.49	67.02	51.42	
E.F.......	58.47	57.99	50.60	71.08	82.91	76.89	
G.H.......	69.29	80.07	91.87	93.74	63.36	90.21	
J.K.......	45.81	93.56	82.54	57.96	72.12	67.96	
L.M.......	63.42	77.68	79.18	86.60	87.31	82.75	
Daily totals .							

Clerk.	Mon.	Tues.	Wed.	Thur.	Fri.	Sat.	Clerks' Totals.
	$ c.	$ c.	$ c	$ c.	$ c.	$ c.	
A.B........	65.95	24.89	79.79	40.78	37.59	89.61	
C.D........	58.71	41.65	24.67	94.26	70.26	42.51	
E.F........	47.58	99.57	50.60	80.71	91.82	89.76	
G.H........	29.69	70.80	87.91	74.93	36.63	21.90	
J.K........	81.45	56.93	54.82	96.57	12.72	96.67	
L.M........	42.63	68.77	81.79	60.86	31.87	75.82	
Daily totals .							

XXVI.—AREAS.

(1) A rectangular plot of ground 50 feet long by 40 feet wide is divided into four equal sections by paths running parallel to the sides, and crossing in the middle of the plot. If the path be 10 feet broad, find the number of sods each 1½ feet by 6 inches necessary to sod the four smaller plots.

(2) Find the cost of painting the walls and ceiling of a room 45 ft. × 54 ft., and 12 ft. high, at 15 cents per square yard, allowing for 2 doors 7½ ft. high and 3 ft. wide, and 8 windows 7½ ft. high and 4½ ft. wide.

(3) Find the difference in acres between a square having 4620 feet to a side and the largest circle which could be inscribed within it.

(4) I have a board 8 in. wide and 16 ft. long. How much must be cut off one end to leave a surface (on one side) of one square yard?

(5) What would it cost at 24 cents per square yard to paint the exterior of a rectangular box with lid, 2 ft. 3 in. high, 2 ft. 6 in. wide, and 3 ft. long?

(6) I have two fields each of 10 acres. One has a width of 40 rods and the other of 32 rods. Find the difference in cost of fencing the two fields at $.28 per rod of fence.

(7) Church street, Toronto, is 1½ miles long, and the track allowance for the street railway is 12 ft. wide. The track allowance is paved with granite sets, with a face of 8 in. × 4 in. Find the cost of the sets necessary at $25 per thousand.

(8) I have a field 216 yards long and 140 yards wide. To accommodate my neighbor I allow him 10 yards off my width, if he allows me to extend my lot 17 yards to the rear. Is my area increased or diminished, and by how much?

(9) How much carpet is wasted in carpeting a room 18 ft. by 21 ft., with carpet 27 in. wide, running lengthwise of the room, and having a pattern 4 ft. 3 in. in length?

(10) Find the cost of fencing a farm having its sides in the ratio of 5 to 6, if the area of the farm is 192 acres, and the cost $.75 per rod.

XXVII.—AREAS AND CAPACITIES.

(1) The map of Ontario issued by the Crown Lands Department is drawn on a scale of 8 miles to an inch. On this map the township of Scott measures $1\frac{5}{16}$ inches by $1\frac{1}{8}$ inches. How many acres does it contain?

(2) A road is 4 rods wide, how many miles of it would contain 40 acres?

(3) A lot 150 ft. × 100 ft. is to be surrounded by a close board fence 6 ft. high. What will the boards cost at $12.50 per M.?

(4) A metal plate ½ an inch thick was burnished on one side for $22.50 at 5 cents per sq. inch. Find the weight of the plate, if a cubic foot of the metal weighed 576 lbs.

(5) A cubic inch of gold is beaten out till it would cover the four walls and ceiling of a room 40 ft. × 60 ft. × 12 ft. Find its thickness.

(6) A plate of copper 5 ft. 6 in. long, 3 ft. wide and ¾ of an inch thick is rolled into a sheet 4 ft. 6 in. wide and 6 ft. long. Find its thickness.

(7) The bottom of a cistern is 7 ft. 6 in. by 3 ft. 2 in. How deep must it be to contain 3750 lbs. of water, a cubic foot of water weighing 1000 oz. ?

(8) A piece of land is surrounded by a stone wall 8 ft. high and 2 ft. thick ; the land inside the wall is 100 ft. × 50 ft. How many cubic feet of stone does the wall contain ?

(9) It is required to build a sidewalk a quarter of a mile in length, 8 ft. wide and 2 inches thick, supported on three continuous lines of scantling 4 in. sq. What will the lumber cost at $17.50 per M. ?

(10) What will it cost to paint the outside and both floors of a two-storey cottage 36 ft. × 33 ft and 18 ft. high, at 10 cents per sq. yd., the walls to be 18 in. thick, and no allowance to be made for cornices, openings or partitions?

XXVIII.—AREAS.

(1) In a map of a country the scale is $\frac{1}{10}$ of an inch to a mile, and a township is represented on the map by a square whose side is half an inch. How many acres in the township ?

(2) A man bought a rectangular field, 40 rods long by 25 rods wide, paying therefor at the rate of $300 per acre, and then had it fenced at the rate of $1.50 per rod.
Prove the land cost him $125 for every $13 the fence cost.

(3) A map is drawn to the scale of $\frac{1}{2}$ an inch to a mile. How many acres represented by 1 square inch on the map ?

(4) Where the scale is $\frac{1}{4}$ of an inch to a mile, find the value of the lands of a township, average price $32 per acre, represented by a rectangle $\frac{3}{4}$ in. × 1 $\frac{1}{2}$ in.

(5) The cost of carpeting a room 15 feet long, with carpet 27 inches wide, costing 90 cents per yard is $22.50. What is the width of the room ?

(6) What will it cost to prepare a tennis court 49 feet by 180 feet at the rate of 20 cents per square yard?

(7) A lot 11 rods long and 9 rods wide has a fence around it. Outside the lot at a distance of 2 feet from the fence, a sidewalk 4 feet wide is built ; how many square yards of ground does the sidewalk cover ?

(8) A field whose length is to its width as 4:3 contains 1200 square yards. Find the cost of lumber for a 6 foot close board fence around it at $13.50 per M.

(9) Find the cost of decorating a church 84 ft. × 60 ft. and 20 ft. high. The ceiling is painted at 20 cents per square yard ; the walls covered with paper costing $1.10 per double roll, (25 rolls allowed for openings) ; labour costs 25 cents per double roll ; border costs 15 cents per yard.

(10) The Ladies' Aid Society decided to bear the expense of carpeting the floors with carpet 30 in. wide and costing $1.20 per yard. What was the amount of their undertaking ?

XXIX.—SOLIDITY.

(1) How many piles of wood 6 ft. high, and 12 ft. long could be made from 8 piles 12 ft. high and 72 ft. long, and find their value at $3.50 per cord ?

(2) A piece of lead 3 ft. × 4 ft. × 2 in. is rolled till it is now 7½ ft. × 18 ft. Find its thickness in the decimal of an inch.

(3) Find how many cords of 16 in. wood could be obtained from the following :—6 pieces 18 in. × 15 in. to an end and 24 ft. long ; and 3 round pieces 28 in. diameter and 24 ft. long.

(4) A round stick of timber 24 ft. long and 42 in. diameter floats with ⅓ of its volume above the surface of the water. Find the weight in tons of the log, (1 cubic ft. of water weighs 62½ lbs.).

(5) A rectangular cistern is 5 ft. 6 in. by 6 ft. 4 in. Find how many inches the surface will sink if 836 gallons be drawn off. (1 gallon = 277¼ cubic inches).

(6) 1 ton hard coal contains 28 bushel of 80 lbs. to the bushel. Find the value of a bin of coal 15 ft. × 14 ft. × 10 ft. at $5.54½ per ton. (1 bushel = 2218 cubic inches)

(7) Find the weight of a circular lead plate, 14 in. in diameter, and $\frac{144}{100}$ inches thick, given lead 11.4 times as heavy as an equal volume of water.

(8) A cylinder of wood 4 in. to an end and 2 ft. long, was reduced till it was just two inches in diameter. Find what portion of the cylinder was cut away.

(9) There are 46¾ lbs of wheat to a cubic foot. Find the value of a bin of wheat 5 ft. 4 in. high, 6 ft. wide and 6 ft. 8 in. long, at 72 cents per bushel.

(10) Water weighs 1000 ozs. to the cubic foot, and expands $\frac{1}{10}$ in freezing. Find how many tons of ice can be stored in an ice-house 48 ft. long, 33 ft. wide and 20 ft. high.

XXX.—CARPETING.

A.—TO FIND NUMBER OF YARDS.

(1) How many yards of carpet 1 yard wide will be needed to cover a room 12 ft. wide by 18 ft. long ?

(2) Find number of yards required to carpet a room 18 ft. × 24 ft. with carpet 27 in. wide.

(3) Find the number of yards of carpet 27 in. wide necessary to carpet the following rooms : (a) 18 ft. × 21 ft. (b) 20 ft. 3 in. × 24 ft.   (c) 24 ft. 9 in. × 30 ft.   (d) 15 ft. 9 in. × 33 ft.

(4) Find number of yards necessary to carpet the following rooms with material 30 in. wide : (a) 15 ft. × 18 ft.   (b) 17 ft. 6 in. × 21 ft.   (c) 12 ft. 6 in. × 15 ft.   (d) 20 ft. × 24 ft.

(5) Find the number of yards of matting 45 in. wide necessary for the following rooms : (a) 22 ft. 6 in. × 24 ft. (b) 42 ft. × 37½ ft.   (c) 20 ft. × 27 ft.   (d) 14 ft. × 12¾ ft.

B.—TO FIND TOTAL COST.

(6) Find the cost of carpeting the rooms of questions 3 and 4, at 75 cents per yard.

(7) I received a bill for the carpet for my house, (a) parlor 18 ft. × 27 ft., with Axminster 27 in. wide, at $2.50 per yard. (b) dining room 15 ft. × 21 ft., with Brussels 27 in. wide at $1.50. (c) 6 bedrooms each 12 ft. × 15 ft., with Brussels 27 in. wide, at $1.10 per yard. (d) library 12 ft. × 30 ft. with Wilton 27 in. wide, at $1.80. (e) halls $36. Find my bill.

(8) The officers of a church have their church parlor to carpet, and have a choice of a Wilton 27 in. wide at $1.80 per yd., and a 30 in. Axminster at $2.10. If the dimensions are 30 ft. × 36 ft., and the carpet runs lengthwise, find difference in cost.

(9) Find the cost of carpeting a room 18 ft. by 23 ft., with carpet 30 in. wide, and costing $1.35 per yd., the strips running lengthwise of the room, and allowing 12 in. on each strip for matching.

(10) Find the value of the carpet 30 in. wide, and costing $.90 per yd., to cover a floor 19 ft. × 23 ft., the strips running lengthwise, and the pattern 32 in. long.

XXXI.– CARPETING.

C.—10 FIND WIDTH OF CARPET.

(1) The cost of carpeting a room 15 ft. × 21 ft., with carpet worth 75 cents per yd. is $31.50. Find width of carpet.

(2) $75.60 is the cost of carpet for a room 18 ft. × 27 ft. when the carpet sells for $1.05 per yd. Find width of the carpet.

(3) Find the width of the carpet used in carpeting a room 33 ft. × 45 ft. when the cost is $148.50, 90 cents being the price of the goods.

(4) My study is a room 13 ft. 6 in. × 18 ft. I bought tapestry carpet and paid 80 cents per yard for it. My total cost was $28.80. Find the width of the carpet.

(5) The cost of carpeting my library was $64. Had the carpet been 30 in. wide it would have cost $76.80. Find the width.

D.—To find Dimensions of Room.

(6) The bill for carpeting a hall 18 ft. wide is $120. If the carpet be worth $1.25 per yd., and be 27 in. wide, find length of room.

(7) The cost of carpeting a floor 10½ yds. long, with carpet 27 in. wide, and costing $1.35 a yard, was $85.05. Find the width of the room.

(8) I paid 80 cents a yard for carpet 27 in wide, paying a total amount of $28.80. If the room be 18 ft. long, find its width.

(9) What width of room would give a bill of $141.75, for carpeting a room 45 ft. long, with carpet 30 in. wide and costing $1.05 ?

(10) I paid a bill of $46.08 for carpeting a room 16 ft. wide with carpet 32 in. wide at 96 cents per yard. Find length of room.

XXXII.—CARPETING.

E.—To find Price per Yard.

(1) If it costs $48 to carpet a floor 24 ft. long by 18 ft. wide, with carpet 27 in. wide, find price per yard of the carpet.

(2) I have a room to be carpeted 30 ft. × 27 ft. The cost of the carpet is $100, and it is 27 in. wide. Find number of yards of carpet, also price per yard.

(3) Find the price per yd. of carpet 27 in. wide sufficient to cover a room 24 ft. × 27 ft., if the total bill is $115.83.

(4) $40.80 is charged for a 30 in. carpet for a room 15 ft. × 17 ft. Find the price of the carpet.

(5) A room is 17 ft. × 20 ft., and is covered with a 27 in. carpet. The strips are laid lengthwise, and 6 in. is allowed for matching. The total cost being $43.73⅓, Find the price per yard.

F.—Miscellaneous Problems.

(6) What would be the cost at $1.10 per yard, of carpeting a room 18 ft. by 24 ft. with carpet 30 in. wide and running lengthwise of the room, 9 in. being allowed on each strip for matching?

(7) A house-wife wishes to carpet her parlor 18 ft. by 20 ft., with 27 in. carpet worth $1.40 per yd. The carpet runs lengthwise, and 12 in. on each strip is lost through matching. Find cost.

(8) Find the cost of the 45 in. matting worth 80 cents per yard, to cover the lecture room of a church. The room is 30 ft. by 45 ft., and the matting is laid crosswise.

(9) Find the cost of enough stair carpet worth $1.20 per yard to cover a stair of 18 steps, each of 12 in. tread and 8 inches rise, allowing 15 inches extra at top and bottom.

(10) A linoleum is purchased for a kitchen 15 ft. × 12 ft. The linoleum is 45 in. wide and sells at $1.20 per square yard. The material is laid crosswise and 18 inches comes off one end for matching. Find the cost.

PRACTICE IN SUBTRACTION.

From *each* of the following *subtract* **222222** *ten* times in succession :—

(1) 5431229. (2) 5124018. (3) 5431826. (4) 5233816.
(5) 5413236. (6) 5338205. (7) 4904309. (8) 5040818.
(9) 5234088. (10) 5138194.

From *each* of the following *subtract* **333333** *ten* times in succession :—

(11) 7465334. (12) 7634555. (13) 7621049. (14) 7546046.
(15) 7465457. (16) 7546041. (17) 7603945. (18) 7255981.
(19) 6905419. (20) 7649877.

From *each* of the following *subtract* **444444** *ten* times in succession :—

(21) 9876201. (22) 8962755. (23) 8985255. (24) 9564254.
(25) 9810256. (26) 9765801. (27) 9428754. (28) 9582098.
(29) 9610776. (30) 9810666.

From *each* of the following *subtract* **555555** *ten* times in succession :—

(31) 11990485. (32) 12004784. (33) 11435678 (34) 12098-653. (35) 11896748. (36) 11542935. (37) 11648791. (38) 11634974. (39) 11932148. (40) 11419781.

From *each* of the following *subtract* **666666** *ten* times in succession :—

(41) 21027061. (42) 14227192. (43) 14126538. (44) 15530958. (45) 14259216. (46) 20553007. (47) 13872081. (48) 13822696. (49) 13859007. (50) 14062287.

From *each* of the following *subtract* **777777** *ten* times in succession :—

(51) 16435177. (52) 16230526. (53) 16347726. (54) 16477375. (55) 17542864. (56) 18490401. (57) 18812519. (58) 16149405. (59) 15935215. (60) 16387003.

From *each* of the following *subtract* **888888** *ten* times in succession :—

(61) 16856308. (62) 18168567. (63) 9687555. (64) 18237559. (65) 16347847. (66) 14276525. (67) 15328737. (68) 13286564. (69) 9468265. (70) 9647818.

XXXIII.—CLOCK QUESTIONS.

(1) What time after 4 o'clock will the minute and hour hands of a clock be together?

(2) What time after (a) 6 o'clock, (b) 7 o'clock, (c) 9 o'clock, (d) 11 o'clock, will the hour and minute hands of a clock be together?

(3) What time after (a) 4 o'clock, (b) 5 o'clock, (c) 8 o'clock, (d) 10 o'clock, will the hour and minute hands be 5 minute spaces apart?

(4) At what time after (a) 4 o'clock, (b) 6 o'clock, (c) 8 o'clock, will the hands of a watch make an angle of 90°?

(5) At what time after (a) 7 o'clock, (b) 9 o'clock, (c) 11 o'clock, will the hands of a clock be opposite each other?

(6) When after 7 o'clock will the figure VII be midway between the hour and minute hands?

(7) At what time after 9 o'clock would the hands of a clock make an angle of 120 degrees?

(8) When first after 3 o'clock will the hands of a watch make an angle of 45 degrees?

(9) It was between 7 and 8 o'clock and a gentleman looking at his watch saw that the hands were just 5 minute spaces apart. What was the exact time?

(10) At what time between 4 and 5 o'clock are the hour and minute hands of a watch just 2 minutes apart?

XXXIV.—TRAIN AND STREAM QUESTIONS.

(1) A train 330 feet long crosses a bridge 247½ feet in length at the rate of 15 miles per hour. Find time required to cross the bridge.

(2) Telegraph poles are placed 55 yards apart. A train passes 16 in a minute. Find rate of train in miles per hour.

(3) A train leaves Toronto for Montreal at 6.30 p.m., at the rate of 25 miles per hour; at 9 p.m. a second train follows the first at the rate of 35 miles per hour. How far from Toronto will the second train overtake the first?

(4) A train leaves Montreal for Toronto a distance of 333 miles at 6.30 p.m. on Monday at the rate of 25 miles per hour. At 9.30 of the same evening a second train leaves Toronto for Montreal at the rate of 35 miles per hour. When and where will they meet?

(5) There are two trains moving in opposite directions on parallel tracks. The first, 320 feet in length, and moving at the rate of 24 miles per hour; the second, 340 feet long, and running at 20 miles per hour. Find time required to pass.

(6) A man rows down stream a distance of 12 miles in 1½ hours, and back again in 3 hours. Find rate of rowing in still water.

(7) A train 150 yards long running 25 miles per hour crosses a bridge in 22½ seconds. Find the length of the bridge.

(8) A bridge 243 yards long is crossed in 22½ seconds by a train moving at the rate of 33 miles per hour. Find length of the train.

(9) A bridge three times as long as the train crossing it at 36 miles per hour is crossed in 22½ seconds. Find length of the train and the bridge.

(10) How far may I travel by train at 20 miles per hour, and return by bicycle at 8 miles per hour, that the round trip may occupy 5 hours 36 minutes?

XXXV.—LUMBER AND TIMBER.

(1) Express the cost of 1 foot of lumber when the price is (a) $12.86 per M. (b) $17.96 per M. (c) $23.31 per M., and (d) $31.79 per M.

Note.—In solving questions of this type, we need only remember that if 1000 feet costs $11.74 that is equivalent to saying it cost 1174 cents per 1000 feet, *i.e.*, 1.174 cents per foot of lumber. The price of any number of feet is then easily found.

(2) Find the cost of (a) 5500 feet lumber at $10 per M.; (b) 8750 feet lumber at $12.50 per M. ; (c) 12570 feet lumber at $15.50 per M. ; (d) 28765 feet lumber at $11.74 per M.

(3) Find the value of the following pieces, (a) a plank 18 ft. long, 16 in. wide, 2 in. thick, at $12 per M. ; (b) 4 scantlings, 4 in. × 4 in., and 16 ft. long, at $16 per M.; (c) 8 beams 8 in. × 12 in., and 12 ft. long, at $12.50 per M. ; (d) 15 planks 18 ft. long and 3 in. thick, and 14 in. wide, at $18 per M.

(4) Find the cost of the material necessary for a close board fence round a half acre lot 10 rods long, if the posts be 8 ft. 3 in. from centre to centre, and cost 10 cents each, 2 stringers 2 in. × 4 in. costing $12.50 per M., and the lumber be set on end and 6 ft. high, at $13.50 per M.

(5) Find the cost for the material for a 6 ft. sidewalk around the lot of No. 4 above, placing the walk 2 ft. from the fence. The plank used was 2 in. stuff and cost $15 per M. ; there were three cedar stringers used 4 in. × 4 in. worth $12.50 per M.—allow nothing for waste.

(6) Find the cost of inch lumber needed to cover the roof of a barn, each side of the roof being 60 ft. × 24 ft., the lumber costing $14.00 per M.

(7) The sides of a barn are 40 ft. × 60 ft. and 15 ft. high. Find cost of inch lumber to enclose the sides at $17.48 per M.

(8) A contractor is making an estimate for the lumber required to enclose a barn 40 ft. × 60 ft. and 15 ft. from the ground to the edge of the roof, the edges of the roof project 1 ft. beyond the ends of the building and are 24 ft. to an end ; the point of the gable is 10 ft. above the level of the sides. What is the amount of his estimate at $14.50 per M. ?

(9) A picket fence round a field of 2 acres, 20 rods long, is built ; the pickets are 4 ft. long and 4 in. wide, and are laid 4 in. apart. A base board 1 in. thick and 15 in. wide, runs along the bottom ; 2 stringers 2 in. × 4 in. are used to secure the pickets. Find the cost of the sawn material at $12.50 per M.

(10) The following material was received from a saw mill for a bridge : 24 beams 8 in. × 12 in. and 12 ft. long ; 16 pieces 6 in. × 8 in. and 16 ft. long ; 150 pieces 4 in. × 4 in. and 15 ft. long ; 240 planks 3 in. thick, 16 in. wide, and 18 ft. long; and 2450 ft. inch lumber. All the material is put in at $15.00 per M. Find the bill.

XXXVI.—MIXTURE QUESTIONS.

(1) There is a mixture of 90 lbs. of tea, part at 80 cents and a portion at 75 cents. The total cost is $70.50. Find the number of pounds of each.

(2) Of two chests of tea one is heavier than the other by 7 lbs. The value of both at 61 cents per lb. is $50.63. Find the weight of each.

(3) A merchant sells 111 lbs. of tea for $56.49, part of it at 55 cents and part at 43 cents per lb. Find how many lbs. of each.

(4) 38 yards of silk and velvet sell for $37.95. If the quantities were interchanged the price would be $39.95. The velvet costs 90 cents per yard. Find the number of yards of silk.

(5) I have 38 more 10 cent pieces than I have of 25 cent pieces. The total value is $30.05. Find number of coins.

(6) I have 100 lbs. of tea which when sold for $85 gave a profit of 25%. If some were at 60 cents per lb., and the remainder worth 80 cents per lb., find the number of lbs. of each kind.

(7) I sold a mixture of 72 gallons of wine at $3.30 per gallon and made a profit of 20%. There are 12 gallons more of the dearer kind than of the cheaper, while the difference of price is 60 cents per gallon. Find the prices.

(8) 140 lbs. of coffee and chickory when sold for $56.50 gave a profit of 25%. The difference in price was 26 cents per lb., while the difference in weight was 100 lbs. Find the values of each.

(9) A farmer sold 1260 lbs. of wheat and 2040 lbs. of oats for $27.60, getting 35 cents per bushel more for the wheat than for the oats. Find price of each per bushel.

(10) 42 bushels of wheat and 30 bushels of oats were sold for $34.20, the wheat bringing $\frac{2}{17}$ of a cent per pound more than the oats. Find the price of each per bushel.

XXXVII. - **RATIO.**

(1) 4 miles, 283 rods, 1 yard is what fraction of 8 miles, 45 rods, 1 yard, 2 feet?

(2) Reduce 21 guineas to a decimal of £61 5s.

(3) Express in inches ⅞ of a mile.

(4) Two errand boys were on a message : the first carried 25 lbs. Troy and the second 36 lbs. Avoir. The weight carried by the first was what fraction of that carried by the second.

(5) A farmer delivers 63 bushels of barley at one load, and 56 bushels of wheat by the next. The second load is how many times the weight of the first?

(6) Reduce the weight of 49 bushels of oats to a decimal of the weight of 51 bushels of rye.

(7) 5 guineas + 10 sovereigns must be multiplied by what factor to make it equal to 5 (60 crowns + 40 half-crowns + 27 shillings)?

(8) Express $\frac{8}{11}$ of an acre in roods, square rods, etc.

(9) Reduce $\frac{4}{23}$ of $\frac{7}{10}$ of $\frac{31}{35}$ of 2 miles to the fraction of $1\frac{4}{11}$ of $\frac{7}{18}$ of 5456 yards.

(10) Reduce $\frac{7}{8}$ of 4£ 10s. + $\frac{7}{15}$ of 21 crowns + $10\frac{2}{7}$ sovereigns to the fraction of $222\frac{13}{12}$ guineas.

XXXVIII.—RATIO.

(1) A can run 2 yards while B runs 5 ft. By how much should A win in a 100 yards race?

(2) A can run 4 yards while B runs 3; but in a quarter mile race A gives B a start of 109 yards. Who wins, and by how much?

(3) In a quarter mile race A can run 6 yards for B's 5 and to make an interesting finish A gives B a start of 70 yards. At the end of 300 yards A slipped and thus lost 2 steps of 3 yards each in length. Who wins, and by how much?

(4) In a 440 yard race A can give B 20 yards start and C 30 yards, and all three would finish together. B and C run a 444 yard race starting even. By how much should B win?

(5) A and B start together and walk in the same direction, A at the rate of 4 miles an hour and B at the rate of 3 miles an hour. At the end of 7 hours A turns and goes back. How many miles will B have gone when he meets A?

(6) Two men start from the same point at the same time to walk in the same direction around a block of land 1¼ miles square. A travels at the rate of 4 miles and B at 3 miles per hour. How far does A walk before he overtakes B?

(7) A runs a mile race with B and loses; had his speed been ⅓ greater he would have won by 22 yards. Find the rate of A's speed to B's.

(8) A can run a mile race in 5 minutes, B in 6 minutes. How many yards start should A allow B in order to make their chances equal?

(9) Of two horses in a race the 1st can take 15 strides of 18 feet each, while the 2nd horse takes 14 strides of 20 feet each. The 1st horse is placed 63 yards in front of the 2nd at the start. Which wins in a mile race, and by how much?

(10) A hound pursuing a hare takes 3 leaps for the hare's 4, but 2 of the hound's leaps are equal to 3 of the hare's. The hare has a start of 50 of her own leaps. How many leaps must the hound take to catch the hare?

PRACTICE IN SUBTRACTION.

Find, by repeated subtraction, how many times we can take: (1) 76944758 from 5394025·2. (2) 64877436 from 844052426. (3) 89646978 from 1166059711. (4) 89646978 from 897118777. (5) 89764576 from 718603362. (6) 78964574 from 869356003. (7) 64798585 from 842860264. (8) 96745885 from 774842036. (9) 96485978 from 1158-676482. (10) 86947869 from 1131291051. (11) 76849845 from 999603540. (12) 49765499 from 598133844. (13) 89654679 from 718192170. (14) 95467894 from 1146550206. (15) 89768457 from 719041632. (16) 94637489 from 852235266. (17) 97865768 from 881378661. (18) 998-75646 from 1099100001. (19) 74958746 from 525548816. (20) 93758648 from 1032139813. (21) 86754659 from 781360725. (22) 75684659 from 757415384. (23) 5555-5555 from 555777772. (24) 87654321 from 1051962963. (25) 45647589 from 320028999. (26) 46758495 from 561699804. (27) 98576897 from 690624857. (28) 5679-7684 from 739128571. (29) 48965785 from 637555204. (30) 79869485 from 559585171. (31) 68976895 from 828768616. (32) 74689759 from 597704826. (33) 69785-476 from 489256981. (34) 93698756 from 937847238. (35) 87694736 from 965291052. (36) 94786978 from 123-2799463. (37) 64978465 from 520615414. (38) 9837-6559 from 984564244. (39) 78436923 from 549604674. (40) 45792416 from 412255200. (41) 46598896 from 420078029. (42) 89464998 from 1163614760. (43) 56789654 from 738644429. (44) 45678965 from 50294-8271. (45) 96754897 from 871373019.

XXXIX.—SHARING.

(1) Divide $1250 between A and B giving A 4 times as much as B.

(2) Divide $1000 among A, B, and C, so that A may have $60 more than B, and twice as much as C.

(3) Divide $30 between A and B, giving A $3.50 more than B.

(4) Divide $3600 among A, B, and C, so that A may have $70 more than B, and twice as much as C.

(5) A, B, and C receive $4032 for a contract, B receives $17 more than C, and $35 less than A. Find share of each.

(6) Divide $89.16 among 3 men so that the 1st may receive $2.18 more than the 2nd, but 80 cents less than the 3rd.

(7) Divide $1200 between A and B so that A's share is to B's as 2 is to 7.

(8) The daily wages of 27 men and 37 boys is $82.60. If a man receives 3 times as much as a boy, find the daily wages of a man and of a boy.

(9) A house and lot are together worth $2100 : ¼ the value of the house is equal to ⅓ the value of the lot. Find the value of each.

(10) In a factory are 12 men, 16 women, and 30 boys. The weekly wages is $330. If a man were paid as much as 2 women, and a woman as much as 3 boys, what is the share of each ?

XL.—SHARING.

(1) Divide $1209 among three men, giving to the 1st $½ as often as the 2nd gets $⅓, and the 3rd $¼.

(2) Three boys are given farms by their father. The eldest son gets 1¾ acres for every 1½ acres that the second receives, and for every 1⅓ acres given the youngest. Find the share of each, if the whole amount be 1265 acres.

(3) If A gets $\frac{5}{11}$ of the whole, and B gets ¼ as much as C, find the share of each in a legacy of $9500.

(4) Divide $345 among A, B, and C, so that B will receive $5 for A's $4, while C receives $6 for A's $5.

(5) Divide $510 between A and B, so that $\frac{2}{3}$ of A's share equals $\frac{3}{4}$ of B's.

(6) If $\frac{4}{5}$ of A's money is equal to $\frac{3}{4}$ of B's, and their total money is $665, find the share of each.

(7) 702 votes were cast in an election at which X, Y, and Z were candidates. $\frac{2}{3}$ of the votes cast for X is equal to $\frac{3}{4}$ of those cast for Y, while $\frac{1}{2}$ of Y's made $\frac{5}{8}$ of Z's. Find votes cast for each.

(8) Three churches together have 1816 seats : $\frac{5}{12}$ of the seats of the 1st is equal to $\frac{3}{8}$ the number of those in the second ; but $\frac{5}{8}$ of the seats in the 2nd is as many as $\frac{2}{3}$ of those in the 3rd. Find number of seats in each.

(9) Divide $682.20 among three persons so that the 1st may have twice the 2nd, and the 3rd as much as the other two together

(10) A has $18 less than B, and $23 less than C. After A has given B $7, and C $11, how much has C more than B? Also how much less has A than B and C, respectively ?

XLI.—SHARING.

(1) A farmer sold an equal number of horses, cows, and calves, receiving $3540 for the whole. Valuing a horse at $69, a cow at $37, and a calf at $12, find the number of each.

(2) A farmer bought a number of horses and cows for $2000. There were three times as many cows as horses, and a horse costs twice as much as a cow. If each horse cost $80, how many cows did he buy ?

(3) In a factory 12 men, 16 women, and 30 boys are employed. The weekly wage bill is $330.00. A man is paid as much as two women, and a woman as much as three boys. What is a week's wages for 5 men, 7 women, 14 boys ?

(4) A and B were candidates in an election in a constituency of 2700 voters. The votes polled by A were to those polled by B as 23 to 25, and B was elected by a majority of 100. How many electors did not vote ?

(5) A farmer employs a number o men and 8 boys. He pays the boys 65 cents and the men $1.10 per day. The amount that he paid to all was as much as if each had received $.92 per day. How many men were employed?

(6) Gunpowder is composed of nitre, charcoal, and sulphur, in the proportions of 15, 3, and 2. A certain quantity of gunpowder is known to contain 20 cwt. of charcoal. Find its weight, and also the weight of the nitre and sulphur which it contains.

(7) Lead weighs 11.4 times as much as water, and platinum weighs 21 times as much as water. What weight of platinum will be equal in bulk to 56 lbs. of lead?

(8) Four men can do as much work as 6 women or 8 boys. Ten boys in 8 days earn $48.00. Find the sum earned by 23 men and 14 women in 12 days.

(9) $264.00 is the weekly wages of an equal number of men, women, and boys. The men are paid $1.33⅓ per day, the women 90 cents, and the boys 70 cents. Find the number of each.

(10) A poulterer expended $128.00 in the purchase of an equal number of ducks, geese, and turkeys. A duck cost ¾ as much as a goose, and a turkey is worth as much as a duck and a goose together. Find the number of each, when ducks sell at 60 cents per pair.

XLII.—ALLIGATION AND MIXTURES.

(1) 5 geese and 7 turkeys cost $8.25, while 8 geese and 5 turkeys cost $8.55. Find the price of each.

(2) 9 lbs. of green tea and 11 lbs. black is worth $14.10, while 8 lbs. of green and 5 lbs. of black is worth $8.95. Find the value per lb. of each.

(3) 25 yards silk and 30 yards velvet cost $48.50, while 30 yards silk and 25 yards velvet cost $50.50. Find value of 11 yards silk and 11 yards of velvet.

(4) 5 gallons brandy and 9 gallons wine is billed at $44.00; and 8 gallons brandy and 5 gallons wine on a second invoice totals $37.50. What is the amount of a third invoice for 6 gallons brandy and 4 gallons wine?

(5) 100 lbs. tea and coffee costs $50. The tea cost 60 cents and the coffee 35 cents per lb. Find the number of lbs. of each.

(6) A mixture of 67 lbs. of black and green tea is worth $50.40. The black is worth 80 cents per lb., and the green 70 cents per lb. Find number of lbs. of each.

(7) How many gallons each of wine at $3.25 and $2.25 per gallon would give a mixture of 72 gallons worth $2.66⅔ per gallon?

(8) In a mixture of 60 gallons ⅓ is wine. How much wine must be added so that the wine may be 80% of the mixture?

(9) There is a mixture of 90 gallons of brandy and water, of which the brandy is 90%. How much water must be added to reduce the brandy to 50%?

(10) From a mixture of 60 gallons of brandy and water, in the ratio 2:1, 10 gallons is drawn off and replaced with 10 gallons of water. Find the ratio between the brandy and water now in the mixture.

XLIII.—EXCHANGE OF VALUES.

(1) 4 lbs. tea are worth 9 lbs. coffee, and 6 lbs. coffee are worth 15 lbs. sugar. How many pounds of sugar are equal in value to 56 lbs. of tea?

(2) If 2 lbs. of tea be of value equal to 50 oranges, and 42 oranges be worth 56 lemons, find the value of 1 lb of tea when 5 lemons cost 9 cents.

(3) 1 franc = 9¾ d., and 1 shilling = 24⅓ cents. Express in francs $28.47.

(4) In performing a piece of work, 1 man = 2 women, and 1 woman = 3 children. Find how many women are the equivalent in working power of 6 men, 13 women, and 27 children.

(5) 9 apples cost as much as 7 plums, and 5 plums as much as 3 pears. How much tea worth 75 cents per pound could be bought with the proceeds of the sale of 105 doz. apples, given that 147 pears fill a bushel and are worth $2.25 per bushel?

(6) 60 cents buys 15 oranges, 20 lemons, or 48 bananas. How many oranges would be a fair exchange for 8 doz. lemons, and 16 doz. bananas?

(7) Raisins sell for 15 cents per lb. 7 lbs. raisins are worth 15 lbs. currants, 8 lbs. currants cost as much as 4 lbs. of prunes, and 9 lbs. of prunes would pay for 2 lbs. of tea. How many lbs. of tea would be exchanged for 35 lbs. raisins?

(8) 3 chickens are worth as much as 2 ducks, 3 ducks as much as 2 geese, 3 geese as much as 2 turkeys. When geese sell for $6.48 per doz., find the cost of 10 of each kind.

(9) 3 lbs. sugar = 5 lbs. rice; 15 lbs. rice = 2 lbs. coffee; 5 lbs. coffee = 3 lbs. tea. I get an equal quantity of each of the others in exchange for 61 lbs. of tea. How many pounds of each did I get?

(10) 9 bushels of oats cost as much as 5 bushels of peas, 4 bushels of peas as much as 3 bushels of barley; and 5 bushels of barley as much as 4 bushels of wheat. Find the value of a feed mixture of 12 bushels of oats, 9 bushels of peas, and 5 bushels of barley, when wheat cost 75 cents per bushel.

XLIV.—WORKING PROBLEMS.

(1) A can do a piece of work in 5 days, and B can do it in 6 days ; find time when both work together.

(2) Tom could dig a drain in 14 days, and Sam in 16 days. Find the time when both work together.

(3) To build a piece of fence A requires 6½ days, and B 5⅛ days. Find time when both work together.

(4) If A can do ⅔ of a piece of work in 2¼ days, and B can do ⅝ of the same work in 3¾ days, how long will it take A and B working together to do a work twice as large?

(5) Three boys can saw a pile of wood in 3¾ days, 4⅓ days, and 5¼ days, respectively. They conclude to work together. Find their time.

(6) To set the type for a piece of book work 4 compositors could do the work in 22½ days, 18 days, 19⅞ days, and 25⅞ days respectively. The sum of $48.41 is paid for the work: find the share of each, when all work together.

(7) If A can do as much work in 4 days as B can in 3 days, divide $14.84 justly between them, they having received that sum for a job on which they worked together.

(8) Two brothers work together, but the younger requires 11½ days in which to do as much as the elder can do in 9⅓ days. Divide fairly $31.23 which they receive for a piece of work.

(9) A and B together can do a piece of work in 12 days. A can do it alone in 22 days. Find B's time when working alone.

(10) Two journeymen can do the plastering of a town ... in 6 days when working together. B alone would require 14 days, find A's time.

XLV.—WORKING PROBLEMS.

(1) A and B together can do a piece of work in 6⅓ days; A can do it in 9 days. How long would it take B to do it?

(2) The wages of A and B together for 22½ days amount to the same sum as the wages of A alone for 38⅞ days. For how many days will this sum pay the wages of B alone?

(3) A and B can do a piece of work in 6 days, B and C in 8 days. A and C in 7 days. Find time required by each when working alone.

(4) Of three men, the 1st and 2nd can together do the brick work of a stable in 6$\frac{4}{13}$ days, the 1st and 3rd in 6⅜ days, while the 2nd and 3rd would require 7$\frac{7}{19}$ days. Find time when each works alone.

(5) A can do a piece of work in 5 days, B in 6, and C in 8. If A and B work at it two days each, how long will it take B and C to finish it?

×(6) A, B and C do a work in 12 hours ; A and B can do it in 16 hours, and A and C in 18 hours. In what time can each do it separately ?

(7) A could alone do a work in 18 days. After working alone 12 days, B comes to assist, and the work is completed in 3⅞ days. Find the time for B alone.

(8) A can lay 4000 brick while B lays 3000. They work together and finish a job in 12 days. Find time required for each. If $84 were paid for the work what is each man's share ?

(9) A can do a piece of work in ⅖ of a day, B in ½ a day, C in ⅔ of a day. Find time required to do 4 such works, all working together.

(10) If A required ¾ of a day to complete a piece of work, which B could do in ⅚ of a day, and C in ⅞ of a day, how much could the three do in a day if all worked together ?

XLVI.—ADDITIONAL PROBLEMS.

(1) If 3 men *or* 5 boys can do a piece of work in 20 days, find the time for 3 men and 5 boys.

(2) 4 men can do as much as 6 boys, and 4 men could dig a ditch in 15 days. Find the time if 5 men and 15 boys were employed.

(3) 8 men and 12 boys can complete a work in 6 days, while 12 men and 24 boys would require 3⅞ days to do the same work. Find the time required for 16 men and 48 boys.

SOLUTION :—

(1) 8 men and 12 boys do ⅙ of work in 1 day.

(2) 12 " " 24 " " $\frac{7}{24}$ " " 1 "

Multiply (1) by 2 and we get

(3) 16 men and 24 boys do ⅓ of work in 1 day.

(3)—(2) gives

(16 men + 24 boys) − (12 men + 24 boys) can do (⅓ − $\frac{7}{24}$) of work in 1 day.

i.e., 4 men can do $\frac{1}{24}$ of work in 1 day,

∴ 1 man " $\frac{1}{96}$ " " 1 day.

Supply value for 8 men in (1) above, and we have
$1\frac{1}{2}$ of work + work of 12 boys = $\frac{1}{8}$ of work in 1 day,

∴ work of 12 boys = $\frac{1}{12}$ of work in 1 day,

∴ 1 boy can do $\frac{1}{144}$ of work in 1 day.

Hence in 1 day 16 men and 48 boys do

$(\frac{16}{96} + \frac{48}{144})$ of work

$= \frac{1}{2}$ of work. ∴ Time = 2 days.

(4) If 8 men and 15 boys can do a piece of work in $3\frac{1}{4}$ days, and 12 men and 6 boys would require $3\frac{3}{4}$ days for the same work, find the time necessary for 9 men and 18 boys.

(5) 5 men and 8 boys can do a work in $2\frac{2}{3}$ days, while 4 men and 10 boys would need $2\frac{6}{7}$ days. Find the daily wages of a man and of a boy if $30 be paid for the work.

(6) A can do a piece of work in 8 days, and B in 10 days. After 2 days B leaves. How many days more are needed for A to finish?

(7) A and B together can do a piece of work in $15\frac{1}{2}$ days; B by himself could do it in 62 days. How would you divide $64 paid for the work?

(8) Five men can do a piece of work in 20 days. After working 15 days they are joined by another man, and the work is completed in 19 days. How many days would the sixth man require to complete $\frac{2}{3}$ of the work?

(9) If 18 men can do $\frac{2}{3}$ of a piece of work in 30 days, working 10 hours per day, in what time should 15 men do the whole work, working 9 hours per day?

(10) A does $\frac{1}{2}$ of a work in 6 hours; B does $\frac{3}{4}$ of what remains in 2 hours, and C finishes what is left in 30 minutes. Find the time were all working together.

XLVII.—WORKING PROBLEMS.

(1) A farmer hires a farm hand for a year, agreeing to give him $160 and 10 sheep. But the man leaving at the end of 7 months, got as a fair settlement the sheep and $60. Find the value of each sheep.

(2) I engaged a lad for 8 months for a suit of clothes and $140. He left at the end of 5 months, when I paid him $80 in addition to the suit. Find the value of the suit.

(3) 15 men can do a piece of work in 22 days, how many men would do 4 times the work in $\frac{1}{3}$ of the time?

(4) I engage a sawyer for my mill and am to pay him $2 and his board for every day he works. On the days he is idle I am to receive $1.00 for his board. At the end of 50 days he received $64. How many days was he idle?

(5) A piece of work can be done in $11\frac{1}{4}$ hours by 2 men or 5 women or 12 boys; what time would be occupied by 4 men, 5 women and 6 boys?

(6) A boy was to work for a man two weeks for a cap and $5.70. He quit at the end of 9 days, getting the cap and $3.90. What was the cap worth; also, what was the boy being paid per day?

(7) A man is to receive $1 for every day he works, and forfeits 50 cents for every day he is idle. At the end of 60 days he receives $54. How many days did he work?

(8) The wages of A and B for $15\frac{5}{8}$ days would pay the wages of A alone for $29\frac{11}{16}$ days. Find how long it would pay the wages of B alone.

(9) The money paid B for $14\frac{5}{8}$ days' service would engage A and B for 8 days. For how long would A work for the same sum?

(10) 3 men can dig a trench in 8 days. They work at it for 5 days when one of them falls ill, and the other two finish the work in 5 days more. How much of the work did the first man do before he fell ill?

ARITHMETIC.

MULTIPLICATION TIME TESTS.

5 For Constant Multiplier.

Multiply each of the following numbers using **5** as a factor **12** times in succession :—

(1) 986798.	(2) 789649.	(3) 987654.	(4) 456789.
(5) 789456.	(6) 679878.	(7) 793865.	(8) 986745.
(9) 728397.	(10) 684927.	(11) 579879.	(12) 928793.
(13) 489657.	(14) 826737.	(15) 592687.	(16) 682973.
(17) 298769.	(18) 718649.	(19) 384297.	(20) 792685.
(21) 346827.	(22) 796483.	(23) 827927.	(24) 215639.
(25) 471525.	(26) 618829.	(27) 789789.	(28) 717925.
(29) 675477.	(30) 415967.	(31) 238429.	(32) 167247.
(33) 671427.	(34) 928717.	(35) 647929.	(36) 572967.
(37) 615329.	(38) 292485.	(39) 731289.	(40) 416927.
(41) 389877.	(42) 521799.	(43) 868257.	(44) 217965.
(45) 987657.			

6 For Constant Multiplier.

Multiply each of the following numbers using **6** as a factor **10** times in succession :

(1) 77668. (2) 88667. (3) 66778. (4) 55489. (5) 58769. (6) 69748. (7) 76549. (8) 77898. (9) 89875. (10) 97856. (11) 68746. (12) 73948. (13) 88888. (14) 76486. (15) 87987. (16) 74357. (17) 43878. (18) 73848. (19) 98784. (20) 76847. (21) 18637. (22) 76879. (23) 67989. (24) 96588. (25) 76864. (26) 98974. (27) 76843. (28) 45678. (29) 86547. (30) 88878. (31) 67875. (32) 76867. (33) 88767. (34) 67324. (35) 99999. (36) 99789. (37) 88987. (38) 77889. (39) 66458. (40) 57679. (41) 75896. (42) 56879. (43) 45499. (44) 77777. (45) 37468.

XLVIII.—BILLS AND ACCOUNTS.

The following bills are submitted for practice in calculation but especially as an exercise in form. Where possible do all the ruling in *red ink* :—

(1) On April 12, 1897, Jas. Henderson, Morris, bought from D. M. Gordon, Wingham, a bill of goods as follows :

28½ yds. flannel at 68 cents ; 35 yds. calico at 15 cents ; 3½ doz. pairs stockings at 16⅔ cents per pair ; 7 pairs gloves at 90 cents ; 12½ yds. linen at $1.12 ; 4 pairs muslin curtains at $4.20.

(2) On April 19, 1897, Alfred M. Laird, Norval, bought from G. R. Anderson & Bro., of Brampton, 12½ yds. cassimere at $2.75 ; 18⅓ yds. silk at $1.17 ; 23¾ yds. flannel at 37½ cents ; 112 yds. print at 9⅛ cents ; 55 yds. shirting at 17½ cents ; 37½ yds. tweed at $1.12.

(3) On April 30, 1897, Paul Powell, Turnberry, sold to T. A. Mills, Wingham, to apply on a current account of $54.45 : 1680 lbs. hay at $15 per ton ; 3¾ cords wood at $4.80 ; 4 bbls. apples at $2.75 ; 350 lbs. flour at $2.50 per cwt.; 30 lbs. 10 ozs. butter at 16 cents per lb. How do the accounts stand now?

(4) May 21, 1897, W. F. Chapman, Wingham, bought from C. N. Griffin, as follows : 3¾ lbs. tea at 80 cents ; 300 lbs. sugar at 4¾ cents ; 45 yds. print at 11½ cents ; 2¼ gals. syrup at 65 cents ; 12½ yds. towelling at 12½ cents ; ¾ doz. knives and forks at $2.50 ; 27 lbs. cheese at 15 cents ; 1 lb. 10 oz. lemon peel at 32 cents per lb.

(5) On June 28, 1897, the pupil buys from Husband Bros., Commission Merchants, Toronto : 10 lbs. 2 oz. butter at 16 cents ; 48 lbs. extra butter at 24⅝ cents ; 846 lbs. pork at $6 per cwt.; 6 bars soap at 3 for 25 cents ; 139 eggs at 12 cents per doz. June 30 : 867 lbs. oats at 30 cents ; 7 qts. syrup at 90 cents per gallon.

(6) Wingham, July 5, 1897, McLean & Son, sold the pupil a bill of material, as follows : 1344 ft. lumber at $16.25 per M.; 48480 cub. ft. timber at $59.37½ per M. ; 7400 cedar posts at $7.75 per C. ; 8400 fence pickets at $1.50 per C. ; 9056 brick at $30 per M. ; 5680 feet of inch lumber at $6.25 per M.

(7) Fred Ross, Rose Ave., Toronto, on July 7, 1897, bought from Catto & Co., Dry Goods Merchants, King St., Toronto : 23 yds. cotton at 11 cents ; 13 yds. gingham at 23 cents ; 25 yds. flannel at 37 cents ; 18⅛ yds. tweed at $1.50 ; 12½ yds. serge at $1.75 ; 6½ yds. broadcloth at $4.50. Receipt the bill, the book-keeper, James Burns, signing the receipt for the firm.

(8) Reuben Morley, Toronto, bought from P. Conlin, Grocer, on July 10, 1897 : 3 lbs. butter at 28 cents ; 5 lbs. tea at 56 cents ; 6 bars soap at 17 cents ; 12 gals. coal oil at 27 cents ; 3 oranges at 40 cents per doz. He is allowed a discount of 10 cents for every dollar's worth purchased. Find his change out of a $10 bill.

(9) Thos. Scott, Esquesing, sold to Wm. McLeod, General Merchant, Georgetown, on July 21, 1897, 3015 lbs. hay at $16 per ton. He received 6 lbs. tea at 80 cents ; 22½ lbs. coffee at 26 cents ; 33 lbs. sugar at 12 lbs. for a dollar ; 32¼ lbs. raisins at 18¾ cents ; 14 lbs. 13 oz. bacon at 16 cents per lb., and the balance in cash. Make out the bill on Mr. McLeod's business paper showing the foregoing facts.

(10) The Rice, Lewis Co., Ltd., King St., Toronto, received from J. K. Hampton, Birmingham, England, a bill for the following goods : 375 tons iron plates at £8, 15s., 6d. ; 107½ tons bar iron at £11, 14s. ; 10 tons bolt iron at £10, 10s. ; 48 tons steel at £18, 7s., 6d. ; 15 tons rivets at £11, 1s. ; 17 tons T iron at £15, 10s. Make out the invoice in £., s., and d., and find what sum in Canadian currency will pay the bill. 1 shilling = 24⅜ cents.

XLIX.—INTEREST.

PRINCIPAL, TIME, RATE, TO FIND INTEREST.

Find the interest when :

(1) $2500 prin.,	time	3 yrs.,	rate 7 per cent.
(2) $750 "	"	2 "	" 6 "
(3) $1250 "	"	2½ "	" 4 "
(4) $925 "	"	3½ "	" 8 "
(5) $850.50 "	"	5½ "	" 4 "
(6) $750.25 "	"	2 yrs. 6 mos.,	rate 4 per cent
(7) $800.50 "	"	3 " 4 "	" 6 "
(8) $500 "	"	2 " 5 "	" 6 "
(9) $450.60 "	"	3 " 7 "	" 8 "
(10) $420.40 "	"	5 " 11 "	" 9 "

L —INTEREST.

Find, to the nearest cent, the interest in the following cases :

(1) $2570 prin., from Feb. 12, 1895, to April 26, 1895, rate 5 per cent. (2) $385.75 prin., from June 14, 1896, to Nov. 7, 1896, rate 7 per cent. (3) $268.76 prin., from Aug. 27, 1895, to April 2, 1896, rate 3¼ per cent. (4) $673.73 prin., from March 2, 1896, to Dec. 19 1896, rate 6½ per cent. (5) $1164.35 prin., from April 12, 1896, to Nov. 23, 1896, rate 7½ per cent. (6) $766.50 prin. from May 2, 1896, to Aug. 29, 1896, rate 4⅞ per cent. (7) $302.95 prin., from Oct. 4, 1895, to Jan. 20, 1896, rate 4⅘ per cent. (8) $190.38 prin., from July 4, 1895, to Feb. 8, 1896, rate 6⅝ per cent. (9) $346.92 prin., from Jan. 11, 1896, to Oct. 29, 1896, rate 3¾ per cent. (10) $379.60 prin., from Aug. 21, 1896, to Mar. 13, 1897, rate 5⅝ per cent.

LI.—INTEREST.

INTEREST, TIME, RATE, TO FIND PRINCIPAL.

What principal will yield :

(1) $420 int. in 6 yrs., at 5 per cent. ?
(2) $75 " " 3 " at 10 "
(3) $48.30 int. in 3½ yrs , at 3¾ per cent. ?
(4) $195.30 int. in 3 yrs. 4 mos., at 4½ per cent. ?
(5) $183.28 int. in 2 yrs. 5 mos., at 3¾ per cent. ?
(6) $231.44 int. in 4 yrs. 7 mos., at 9¾ per cent. ?
(7) $32.45 int. from May 15, 1896, to Oct. 8, 1896, at 5⅝ per cent. ?

(8) $61.92 int. from March 5, 1896, to Oct. 10, 1896, at 5¼ per cent. ?

(9) $5.81 int. from June 4, 1896, to Oct. 28, 1896, at 4⅜ per cent. ?

(10) $6.96 int. from Nov. 12, 1896, to Aug. 31, 1897, at 4¼ per cent. ?.

ARITHMETIC.

LII.—INTEREST.

INTEREST, TIME, PRINCIPAL, TO FIND RATE.

At what rate per cent. will
(1) $700 in 3 yrs., yield $126 interest?
(2) $850 in 4 " " $272 "
(3) $1250 in 4½ " " $225 "
(4) $740.60 in 3 yrs. 4 mos., yield $123.43½ interest?
(5) $856.75 from May 3, to July 15, yield $17.135 int.?
(6) $786.25 from March 7, to July 31, yield $25.16 int.?
(7) $325.50 from April 3, to July 8, yield $14.64¾ int.?
(8) $2555 from June 17, to Oct. 30, yield $56.70 int.?
(9) $3285 from July 18, to Oct. 5, yield $49.77 int.?
(10) $1095 from Sept. 12, to Jan. 17, yield $19.05 int.?

LIII.—INTEREST.

INTEREST, PRINCIPAL, RATE, TO FIND THE TIME.

In what time will
(1) $450 prin., at 6 per cent., yield $81.00 interest?
(2) $375 " at 4 " " $90 00 "
(3) $360 " at 8 " " $158.40 "
(4) $768.40 prin., at 7½ per cent., yield $249.73 int.?
(5) $1625.80 " at 5¼ " " $187.7799 int.?
(6) $101.60 " at 6¼ " " $3.81 int.?
(7) $1695.00 " at 7¾ " " $99.44 int.?
(8) $276.90 " at 8¼ " " $9.23 int.?
(9) $2993 " at 3¾ " " $38.13 int.?
(10) $2336 " at 5⅝ " " $63.00 int.?

LIV.—INTEREST.

QUESTIONS INVOLVING THE TERM AMOUNT.

What sum will amount to -
(1) $613.60 in 3 yrs., at 6 per cent.?
(2) $990.00 in 4 yrs., at 8 "
(3) $864.00 in 3¾ yrs., at 5¼ "
(4) $1212.00 in 4¼ yrs., at 5⅝ "
(5) $778.25 in 3⅜ yrs., at 3¼ "
(6) $290.79 in 219 days, at 4⅞ "

(7) $1499.62 from March 3, to July 27, at 7⅞ per cent.?
(8) $945.88 from March 17, to Jan. 3, at 8¼ "
(9) $1129.60 from April 4, to Sept. 24, at 6⅜ "
(10) $1864.15 from May 11, to Oct. 3, at 5⅞ "

LV.—INTEREST.

(1) Find the amount of $850 for 3 yrs., at 6 per cent

(2) What is the interest on $750 for 2½ yrs., at 8 per cent.?

(3) What should be paid for the use of $450 for 9 mos., at 8 per cent.?

(4) If $500 amounts to $630 in 4 yrs., what is the rate paid?

(5) At what rate per cent. will $375 amount to $440 in 3 yrs. 4 mos.?

(6) The simple interest on $900 for a certain time at 6½ per cent. is $247, find the time?

(7) What principal will amount to $1040.40 in 3½ yrs., at 7 per cent.?

(8) At what rate per cent. will $144 in 4 mos., earn $2.88 as interest?

(9) The interest paid a banker for the use of $1250, from May 3 to Sept. 26, is $40. Find what he would receive for the use of $950 from Mar. 8 to October 13, at same rate?

(10) Find the amount of $1525 at 6 per cent., from May 6, 1894, to July 18, 1895, simple interest.

LVI. INTEREST.

(1) $750 was loaned on May 7, 1896, at 6 per cent. On what date did it amount to $786?

(2) How long will it take $300 to earn $300 as interest at 5 per cent., 8 per cent., 9 per cent., 10 per cent., 12½ per cent.?

(3) How long will it take $750 to earn $750 as interest at 5 per cent., 8 per cent., 9 per cent., 10 per cent., 12½ per cent.?

(4) How long will it take $450.60 to double itself at 5 per cent., 8 per cent., 9 per cent., 10 per cent., 12½ per cent. ?

(5) How long will it take any sum of money to double itself at 5 per cent., 8 per cent., 9 per cent., 10 per cent., 12½ per cent. ?

(6) From the foregoing write your own rule for finding the time necessary for any sum of money to double itself when the rate per cent. is given.

(7) In how many years will $950 amount to 3 times itself at 5 per cent., 8 per cent., 9 per cent., 10 per cent., 12½ per cent. ?

(8) On June 5 I borrowed $960, and on Oct. 29, I settled by paying $979.20. What rate per cent. was I paying ?

(9) The amount of a certain sum for 3 yrs., at 8 per cent. is $930.00, but at 10 per cent. the amount would be $975.00. Find the principal.

(10) The amount of a certain sum for 2½ yrs. simple interest is $1080, and for 4 yrs. the amount is $1152. Find principal and rate.

LVII.—**INTEREST.**

(1) At what rate per cent. will $1500 in 4 yrs. amount to the same sum as $1250 at 6 per cent. for 6 yrs. ?

(2) The interest on a certain sum for 5 yrs. is ⅝ of the principal. Find the rate.

(3) I borrow a sum of money for two yrs., agreeing to pay 7 per cent. the first year, and 6 per cent. the second year, simple interest. At the end of two yrs. I discharged the debt with $791. Find the sum borrowed.

(4) $750 is the amount of a certain sum borrowed at 8 per cent., while $718.75 is the amount of an equal sum loaned at the same time at 6 per cent. Find the sum lent and the time.

(5) In 4½ yrs. a certain sum of money amounts to $848.36 the rate being 8 per cent. In how many years *more* will it amount to $939.80 ; also, what was the sum ?

(6) Find the interest on $275.80 for 91 days at 7 per cent.

(7) The amount of a certain principal was $307.20 for $3\frac{1}{2}$ yrs., and $312 for $3\frac{3}{4}$ yrs. Find the principal and the rate.

(8) What sum of money will produce $300 interest in $2\frac{1}{2}$ yrs., at 6 per cent. simple interest?

(9) At what rate per cent. will any sum of money amount to 3 times itself in 25 yrs.?

(10) What will $1 amount to from March 12, 1893, to October 17, 1896, at $7\frac{1}{2}$ per cent.?

MULTIPLICATION TIME TESTS.
7 For Constant Multiplier.

Multiply each of the following numbers, using **7** as a factor **10** times in succession:

(1) 24679. (2) 62749. (3) 97624. (4) 72649. (5) 29647. (6) 92647. (7) 37658. (8) 56738. (9) 85637. (10) 68735. (11) 75368. (12) 87563. (13) 46789. (14) 94768. (15) 67948. (16) 86974. (17) 67498. (18) 98764. (19) 46879. (20) 64897. (21) 87496. (22) 49678. (23) 96748. (24) 74689. (25) 34567. (26) 45637. (27) 74653. (28) 43756. (29) 67435. (30) 57346. (31) 23456. (32) 63254. (33) 46532. (34) 53642. (35) 32645. (36) 64523. (37) 12345. (38) 23145. (39) 45321. (40) 34152. (41) 43521. (42) 24135. (43) 76598. (44) 65789. (45) 95768.

8 For Constant Multiplier.

Multiply each of the following numbers, using **8** as a factor **10** times in succession:

(1) 56789. (2) 67895. (3) 78956. (4) 57896. (5) 78965. (6) 89657. (7) 96578. (8) 67589. (9) 75896. (10) 89654. (11) 96548. (12) 65489. (13) 79568. (14) 95687. (15) 56879. (16) 86597. (17) 78659. (18) 97865. (19) 75864. (20) 58647. (21) 86475. (22) 79465. (23) 94657. (24) 46579. (25) 85697. (26) 56978. (27) 69785. (28) 78985. (29) 89857. (30) 98578. (31) 58979. (32) 89795. (33) 97958. (34) 96215. (35) 62159. (36) 21596. (37) 58742. (38) 87425. (39) 74258. (40) 92145. (41) 21459. (42) 14592. (43) 69124. (44) 78065. (45) 49375.

LVIII.—TRADE DISCOUNT AND COMPOUND INTEREST.

(1) An invoice of stationery amounts to $57.50, on which there are successive discounts of 20 per cent., 10 per cent., and 5 per cent. Find the net amount.

(2) The net payment on an invoice of hardware was $574.56, after three discounts of 25 per cent., 10 per cent., and 5 per cent. had been allowed. Find the original invoice.

(3) I pay $1075.59 as cash payment on an invoice of foreign dress goods after the deduction of three trade discounts of 15 per cent., 10 per cent., and 5 per cent. Find the gross invoice.

(4) My invoice was made out for $4672, on which I was to receive discounts of 25 per cent., $12\frac{1}{2}$ per cent., 10 per cent., and 5 per cent. I immediately sold the goods for $3500; find gain or loss on transaction.

(5) Your bill is $201.60 on which you may have two discounts of 25 per cent., and $12\frac{1}{2}$ per cent., or a single discount of 35 per cent. Which is the better and by how much?

(6) Find the compound interest on $321 for 3 years, at 5 per cent.

(7) On July 1, 1894, a merchant deposits in the P.O. Savings Bank $100, and on July 1 of each succeeding year he deposits a like sum. He draws no interest but allows it to be added to his principal. What sum was to his credit on July 1, 1897, if the rate of interest is 3 per cent.?

(8) What sum of money will amount to $893.262 in 3 years at 6 per cent.?

(9) Find the difference between the simple and the compound interest for 3 years at 8 per cent., on $1250.

(10) What sum must I loan now at 6 per cent. compound interest for three years, that at the end of the time I may be able to meet a debt of $17865.24 due at the end of that period?

LIX.—LOSS AND GAIN.

(1) I sold a coat for $9.00 and gained $\frac{1}{14}$ of cost. Find what I paid for it.

(2) By selling a suit of clothes for $20 there is a gain of $\frac{1}{3}$ of the cost. Find the cost to the dealer.

(3) I made a gain $\frac{2}{15}$ of cost when I sold a horse for $125.29. Find cost price.

(4) A selling price of $96.72 gave me only $\frac{3}{4}$ of what I paid for the article. Find cost price.

(5) $\frac{1}{5}$ of cost was lost when a town lot was sold for $1276.84. Find cost.

(6) By selling a horse for $175 a gain of $\frac{2}{3}$ of cost was made. Find selling price to gain $\frac{1}{4}$ of cost.

(7) Find selling price to gain $\frac{1}{3}$ of the cost if $\frac{2}{7}$ of cost is gained when the article is sold for $121.77.

(8) By selling a horse for $286 there is a loss of $\frac{1}{16}$ of cost. Find what fraction was lost were the sale made for $260.

(9) By selling goods at a profit of $\frac{2}{7}$ of cost, a merchant's gain is $600. Find his selling price had he gained $\frac{4}{11}$ of cost.

(10) When a sale was to gain $\frac{8}{11}$ of cost the gain was $396. What was the rate of loss had we sold it at a loss of $242.

LX.—LOSS AND GAIN.

(1) Goods which cost me $750 were sold at a gain of 15 per cent. Find the selling price.

(2) A horse which cost $137 was sold at a gain of 25 per cent. Find what I sold him for.

(3) When my house was sold for $2316, there was a gain of 20 per cent. Find cost.

(4) I received only 75 per cent. of the cost when I sold for $726. Find gain per cent. when the sale was made for $1331.

(5) Sheep are sold at $4.00 per head and 20 per cent. is lost thereby. Find the cost of a flock of 120.

(6) What per cent. is lost when a $360 horse is sold for $300.

(7) If 10 per cent. be lost by selling an article for $7.20, find selling price to gain 10 per cent.

(8) $172.50 is gained on a boat sold for $922.50. Find rate of gain.

(9) Sold a horse for $150 and gained 25 per cent. Find the cost.

(10) Sold two horses for $150 each gaining 25 per cent. on one and losing 25 per cent. on the other. Find the gain or loss on the transaction.

LXI.—LOSS AND GAIN.

(1) A merchant deducts 10 per cent. for cash. Find marked price of an article sold for $1.71.

(2) What was the marked price of an article for which a dealer received $36.67 after allowing a discount of 5 per cent. ?

(3) $7.03 is 5 per cent. less than what was asked for a coat. What was the asking price ?

(4) I paid $156.24 for a seal sacque after 10 per cent. discount had been allowed. What price did I find marked on the sale ticket ?

(5) Bought a bill of goods amounting to $56.40, on which I am allowed a discount of 20 per cent. for cash. Find change out of five $10 bills.

(6) Two town lots are sold for $2400, or the 1st of which there was a gain of 20 per cent., and on the other a loss of 20 per cent. Find the cost of each, (b) the gain or loss on the transaction, (c) the gain or loss per cent.

(7) Repeat this question substituting two horses sold for $180 each.

(8) Tea sold at 60 cents gave a loss of 20 per cent. Find gain or loss per cent. when sold for 90 cents.

(9) When I sell tea at 72 cents per lb. there is a gain of 28½ per cent. Find the gain when sold for 64 cents per lb.

(10) A house was sold for $1542, making a gain of 20 per cent. Find gain or loss per cent., if sold for $1413.50.

LXII.—LOSS AND GAIN.

(1) Cloth bought at $1.40 per yard is sold for $1.18. Find loss per cent.

(2) A span of horses and carriage cost the dealer $952. He sold the turnout for $1170.96. Find rate of gain.

(3) I lost 10 per cent. when I sold a horse for $177.57. Find selling price to gain 10 per cent.

(4) Find selling price to gain ¾ of the cost if ⅜ of cost is gained when the selling price is $100.87.

(5) By selling my sheep at $5.04 per head there was a loss of 10 per cent. If the flock cost $660.80, how many sheep were in it?

(6) 20 per cent. is lost on a seal sacque when sold for $171.44, find price to gain 20 per cent.

(7) Find selling price of a 56 lb. tea chest, the tea costing 56 cents per lb., and being sold at an advance of 25 per cent.

(8) Find the cost price per doz. of Fedora hats which when sold retail for $2.17 each, gives a profit of 40 per cent.

(9) Find selling price per gross of spools, which when sold for 30⅔ cents per doz. give a profit of 33⅓ per cent.

(10) Two rowing skiffs were sold as the dealer thought to cover the cost of both because he made a gain of 30 per cent on one and threw off 30 per cent. from the cost of the other. He sells them for $48.23 each. Find how far he was out in his calculation.

LXIII.—LOSS AND GAIN.

(1) How many lbs. of 60 cent tea must be mixed with 50 lbs. of 80 cent tea to make a mixture worth 70 cents?

(2) How many lbs. coffee at 40 cents must be mixed with 40 lbs. chickory worth 10 cents to give a mixture worth 30 cents per lb.

(3) How many gals. of wine worth $2.40 per gal. must be mixed with 20 gals. worth $3.00 per gal. that the mixture may be worth $2.75 per gal.?

(4) A cask of brandy worth $2.20 per gal. was by mistake poured into a tank containing 40 gals. worth $3.00 per gal. The mixture proved to be worth $2.70 per gal. Find size of cask.

(5) A miller desires to make a mixture for chopping. He puts in 30 bush. peas at 42 cents, 35 bush. corn at 32 cents. How many bush. oats at 17 cents must he add to give an average price of 28 cents per bush. ?

(6) I make a mixture of 60 lbs. tea worth 80 cents per lb. with 75 lbs. worth 60 cents per lb. Find selling price per lb. to gain 33⅓ per cent.

(7) What quantity of wine worth $2.40 per gal. must be added to 40 gals. worth $3.20 per gal. that the mixture may yield a profit of 40 per cent. when sold for $4.00 per gal. ?

(8) How much chickory at 12 cents must be mixed with 80 lbs. of coffee at 45 cents that there may be a gain of 20 per cent. when sold for $46\frac{2}{23}$ cents per lb. ?

(9) When a mixture of tea is sold at $63\frac{7}{11}$ cents per lb. there is a profit of 25 per cent. If it contains 60 lbs. worth 60 cents per lb., find the number of lbs. of 40 cent tea that was added.

(10) A dealer has 120 gals. of wine worth $3.60, and he intends to add enough water to enable him to sell the mixture for $3.60 per gal., and yet make a profit of 25 per cent. How many gals. did he add ?

LXIV.—LOSS AND GAIN.

(1) ⅔ of selling price is equal to the cost. Find rate of gain.

(2) If ¾ of what I receive for a horse be as much as I paid for him, find the rate of gain.

(3) ½ of the proceeds yields ⅓ of what I paid for a consignment of hats. Find rate of loss.

(4) At 98 cents per lb. for tea I am gaining 16⅔ per cent. Find the gain per cent. when the price is raised to $1.17¾.

(5) I bought a quantity of coffee for $3.50. I retailed

it at 45½ cents per lb. making 30 per cent. thereby. Find the number of lbs. bought.

(6) ⅜ of selling price=⅔ of cost price. Find rate of gain.

(7) A dealer imported 12 pieces silk average length 28 yds., at 90 cents per yd. The customs duties were 35 per cent. of invoice price. Find proceeds of sale to yield a profit of 25 per cent.

(8) A hogshead of French wine containing 125 gals. was invoiced at $2.40 per gal. The duties charged on foreign wines was equivalent to 80 per cent. Find how much higher price for the lot must be charged to make 30 per cent. profit, than had there been no duty?

(9) A crate of chinaware was received, 1/6 of which was damaged. The invoice price was $120. Find at what rate of profit the remainder must be marked to make a profit of 30 per cent. on the transaction?

(10) Bought 60 gals. of brandy at $3.60 per gal. One-third leaked out. At what price per gal. must the remainder be sold to yield 20 per cent. profit?

MULTIPLICATION TIME TESTS.

9 For Constant Multiplier.

Multiply each of the following numbers, using 9 as a factor 10 times in succession:

(1) 79867. (2) 93219. (3) 89378. (4) 56879. (5) 68759. (6) 89697. (7) 69378. (8) 97865. (9) 78695. (10) 96859. (11) 48973. (12) 12345. (13) 89376. (14) 79389. (15) 97369. (16) 48976. (17) 87693. (18) 76938. (19) 69387. (20) 93876. (21) 38769. (22) 79386. (23) 2876. (24) 28761. (25) 87612. (26) 56345. (27) 63455. (28) 34556. (29) 34652. (30) 46523. (31) 65234. (32) 54362. (33) 43625. (34) 36254. (35) 62545. (36) 25456. (37) 54562. (38) 75623. (39) 56237. (40) 62375. (41) 78654. (42) 86547. (43) 65478. (44) 54768. (45) 64875.

MISCELLANEOUS MULTIPLICATION.

Find the following products :

(1) 135792468×4567. (2) 135792468×7654. (3) 135792468×6745. (4) 135792468×5476. (5) 246813579×4567. (6) 246813579×5476. (7) 246813579×6745. (8) 987654321×6754. (9) 987654321×7654. (10) 123456789×6745. (11) 987654321×4567. (12) 987654321×5674. (13) 123456789×4567. (14) 123456789×7654. (15) 123456789×5476. (16) 874325687×8967. (17) 817641358×45698.

LXV.—COMMISSION AND INSURANCE.

(1) Sold 30 bales of cotton, each of 480 lbs., at $12\frac{1}{2}$c. per lb. on a commission of $2\frac{1}{2}$ per cent. Find the amount of commission.

(2) On a sale of 3600 bushels of wheat made at 60c. per bushel, my commission was $48.60. Fnd the rate of commission charged.

(3) A shipment of 560 hogs, averaging 180 lbs., was sent to Montreal for sale. The price realized was $5\frac{3}{4}$ cents per lb. Find the commission at $2\frac{1}{3}$ per cent.

(4) An insurance for $18000 was effected at $\frac{1}{4}$ per cent. Find premium charged.

(5) On my house worth $6000 there is a policy for $\frac{2}{3}$ of its value. Find my loss after paying five premiums of $\frac{3}{8}$ per cent. each, in case my house were destroyed by fire.

(6) My commission on a sale of wheat at 75c. per bushel on a commission of $2\frac{1}{4}$ per cent. is $94.50. Find the number of bushels.

(7) Find the cost of insurance to a business man who held policies on his property as follows : (a) Phœnix Co., $3000 at $\frac{3}{8}$ per cent.; (b) Galt Mutual, $5000 at $\frac{3}{4}$ per cent.; (c) Liverpool and Globe, $3000 at $\frac{5}{8}$ per cent.; (d) The Imperial, $3000 at $\frac{5}{8}$ per cent.

(8) A tax collector is paid $2\frac{1}{2}$ per cent. commission on all taxes he collects. If his share is $214.65, find how much the town receives.

(9) In a town where the collector is paid a commission of $2 per cent. for collecting the taxes, the council desire to raise $17493 for the building of a waterworks system. How much did the collector gather in?

(10) What is the premium for insuring a cargo valued at $35620 at 2½ per cent.?

LXVI.—MISCELLANEOUS PERCENTAGE.

(1) By selling tweed at $2.60 a yd., it was found that there was a gain of 62½ per cent. ; what selling price per yd. would have given a gain of 70 per cent.?

(2) A grocer gained 20 per cent. by selling 10 lbs. sugar for $1. He then raised the price giving only 9 lbs. for $1. What rate per cent. did he make at the new price?

(3) By selling tea at 60 cents per lb. a grocer loses 20 per cent. At what price should he sell to gain 20 per cent.?

(4) Bought oranges at the rate of 10 cents per dozen and sold them at the rate of 5 for 11 cents. Find rate per cent. of gain ; also gain on 11 boxes, each containing 20 dozens?

(5) Find the duty on 8 hhds. of sugar, each weighing 1200 lbs. gross, at 1¾ cents per lb., 16 per cent. being allowed off for packages.

(6) How much water must be added to 92 gals. brandy worth $4.60 a gal., in order that there may be a gain of 25 per cent. when the mixture is sold for $4.50 per gal.?

(7) A merchant buys sugar at $7.50 per cwt. At what price per lb. must he sell to gain 10 per cent.?

(8) A man who lost 33⅓ per cent. of his fortune one year, and 28¼ per cent. of the remainder next year, finds he has $900 left. What had he at first?

(9) A dealer sold a coat for $8.10 and lost 10 per cent. At what price would he have made 10 per cent.?

(10) A dishonest grocer used a weight of 15½ ounces for 1 lb. What gain per cent. does he make by his dis-honesty?

LXVII.—MISCELLANEOUS PERCENTAGE.

(1) A man sold 2 farms for $3600 each. On one he gained 20 per cent., and on the other he lost 20 per cent. Find gain or loss on whole.

(2) A merchant sold a piece of cloth for $24 and lost 25 per cent. What per cent. would he have gained had he sold it for $34?

(3) Water in freezing expands 10 per cent. A cubic foot of water weighs 1000 oz. Find the weight of a cubic foot of ice.

(4) A merchant bought 1000 yds. of carpet at 60 cents a yd., and sold ⅜ of it at a profit of 30 per cent.; ½ at a profit of 20 per cent. and the remainder at a loss of 20 per cent. How much did he receive for the carpet?

(5) A house and lot are together worth $2100; 25 per cent. of the value of the house is equal to 33⅓ per cent. of the value of a lot. Find the value of each.

(6) If in a certain town $3093.75 was raised from a ¾ per cent. tax, what was the value of the property in town?

(7) A man having lost 20 per cent. of his capital now has just as much as another who has gained 15 per cent. of his capital. The second man's capital was originally $9000. What was the first man's capital?

(8) A bushel of potatoes weighs 60 lbs. If a grocer buys a ton of potatoes for $15 and sells them for 15 cents a peck, find gain per cent.

(9) A town whose population was 10000 increased 10 per cent. each year for 3 years; what was its population at the end of that period?

(10) If for $7 I can have the use of $35 for 3 years 4 months, what rate am I paying?

LXVIII.—MISCELLANEOUS PERCENTAGE.

(1) A fruit merchant bought a quantity of apples for $144; he sold half of them for $82.80, thereby gaining 12c. on each bushel. Find how many bushels were bought, also the gain per cent.

(2) A sold a town lot to B, and gained 12½ per cent. B sold it to C for $306, and lost 15 per cent. How much did the lot cost A?

(3) Brown purchased $\frac{7}{15}$ of a mill property for $4064.55, and Smith purchased $\frac{9}{15}$ of the same property at a rate 5 per cent. higher. What did Smith's part cost him?

(4) A farmer whose property is assessed $960, pays on the dollar 1¾ mills for township rates; 1¼ mills for county rates; 1½ mills for railway bonus, and 2½ mills for school rates. How much does he pay in all?

(5) A person sold A 75 per cent. of his land, B 80 per cent. of the remainder, and C $\frac{5}{8}$ of what then remained, and received $50 for what he had left at $60 per acre. Find the number of acres he had at first.

(6) Brooms are bought wholesale at $20 a gross. What per cent. profit will be made by selling them at 20 cents each?

(7) A lad earned $1.16 collecting accounts for a physician. He was allowed 5¾ per cent. How much did he collect?

(8) I sold my watch for 6.00, which was 20 per cent. less than I asked for it, and made a profit of 12½ per cent. on cost. Find cost of watch, also rate per cent. I would have made had I received what I asked.

(9) A man bought a store and contents for $4720. He sold the same for 12½ per cent. less than he gave, and then lost 15 per cent. of the selling price in bad debts. Find his entire loss.

(10) In selling a bill of groceries to the amount of $64, the grocer gave only 15 ounces for every lb. What was his gain per cent. by this alone, also how much was the customer defrauded?

TIME TESTS IN DIVISION.

Divide each of the following, using 5 as a divisor 12 times in succession·

(1) 240904541015625. (2) 141572021484375. (3) 201-840087800625. (4) 175451416015625. (5) 84674500546-875. (6) 151081298828125. (7) 58210205078125. (8)

226737548828125.   (9) 178537353515625.   (10) 127392-
333984375.

Divide each of the following, using 6 as a divisor 10
times in succession :

(11) 4037810300928.   (12) 5434459034176.   (13) 5916-
978118656.   (14) 4465306165248.   (15) 4648579144704.
(16) 4647672152064.   (17) 4104141696000.   (18) 5380703-
603712.   (19) 3487628565504.   (20) 2265546682368.

Divide each of the following, using 7 as a divisor 10
times in succession :

(21) 15152537306858.   (22) 19066514357002.   (23)
20521544364601.   (24) 12359986795244.   (25) 12802060-
759929.   (26) 18583764156461.   (27) 24190332898613.
(28) 13216734425461.   (29) 24715454386504.   (30) 16198-
825629154.

Divide each of the following, using 8 as a divisor 10
times in succession :

(31) 103893111406592.   (32) 105081743605760.   (33)
63073742225408.   (34) 103667625623552.   (35) 61179661-
647872.   (36) 63328219037696.   (37) 84788023132160
(38) 62971736752128.   (39) 23041425801216.   (40) 84778-
359455744.

Divide each of the following, using 9 as a divisor 10
times in succession :

(41) 120489321760956.   (42) 325034555076819.   (43)
218080930360545.   (44) 226205138014875.   (45) 311634-
842623776.   (46) 276801866457786.   (47) 241906128172-
578.   (48) 217488177012375.   (49) 162215670687723.
(50) 268266218244138.

LXIX.—CAPACITY.

(1) Find the value of a pile of wood 128 ft. long, 12 ft.
wide and 8 ft. high, at $3.50 per cord.

(2) A plot of ground 240 ft. × 120 ft. is piled with wood
to the height of 12 ft.   What is its value at $4.50 per
cord?

(3) A lot containing half an acre is piled 8 ft. high with
cord wood worth $3.50 per cord.   Find its value.

(4) A barn 80 ft. long and 60 ft. wide, is built on a lot 308 ft. long and 204 ft. wide. The rest of the lot is covered with cord wood to the depth of 8 ft. How many cords of wood were there?

(5) A farmer delivers to a merchant a pile of wood 88 ft. long, 12 ft. wide and 8 ft. high, worth $3.50 per cord, and takes a carpet 27 in. wide to fit a room 18 ft. wide and 24 ft. long, costing $1.25 per yard, and ta es up a note owing to the merchant for $120, bearing interest at 8 per cent. for one year, and from 15th March to Aug. 8th following. The rest he got in cash. Find that amount.

(6) Wood covering a quarter acre lot to the height of 8 feet is transferred to another lot 120 ft. by 121 ft. How high is the wood piled in the second lot?

(7) A load of wood 10 ft. long, 3 ft. 8 inches wide, and 3 ft. high was sold for $3. What was the price per cord, and at $4 per cord, what would the load be worth?

(8) How many bricks 9 inches long, 4½ inches wide, and 4 inches thick will be required for a wall 60 ft. long, 17 ft. high and 4 ft. thick, allowing that the mortar increases the brick $\frac{1}{14}$ in bulk?

(9) There is a pile of solid bricks which is 36 feet long, 16 ft. 6 inches wide, and 14 ft. 6 inches high, and contains 122496 bricks of uniform size. Each brick is 9 inches long and 4½ inches wide. Find its thickness.

(10) A brick wall is to be built 90 feet long, 17 feet high and 4 feet thick. Each brick is 9″ × 4½″ × 2½″. How many bricks will be required?

LXX —CIRCLES.

Unless otherwise instructed, always assume that the diameter multiplied by 3⅐=circumference of any circle.

(1) Find the circumference of the circle which has the following dimensions : (a) diameter 7 feet ; (b) diameter 4′ 8″ ; (c) diameter 8′ 2″ ; (d) radius 3′ 6″ ; (e) radius 5′ 3″ ; (f) radius 4′ 1″.

(2) Find the diameter when the circumference is : (a) 11′ ; (b) 12′ 10″ ; (c) 20′ 2″.

(3) Find the area when (a) radius = 7′; (b) radius = 154′; (c) radius = 9′ 4″.

(4) Find the area when (a) circumference = 14′ 8′; (b) diameter = 3′ 6″; (c) circumference = 22′.

(5) The wheel of a wheelbarrow is 20″ in diameter. How many times will it turn in going a mile?

(6) The fore-wheel of a carriage turns 420 times more than the hind one does in going a distance of three miles. If diameter of smaller wheel be 3′, find circumference of larger.

(7) The length of the minute hand of a fire-hall clock is 42″. Find the distance travelled by the extreme point of the hand in a year of 365 days.

(8) The hour hand of the same clock is but 28″ long. Find how much farther the extreme point of the minute hand travels in a year of 365 days than does the extreme point of the hour hand.

(9) A bicyclist riding a wheel of 26″ diameter counts 168 revolutions per minute. Find distance travelled in one hour.

(10) A horse in trotting takes 180 steps per minute, each 5′ 6″ long. Find how many times the hind wheel (5 feet in diameter) of the buggy will turn in one hour.

LXXI.—CIRCLES.

(1) A circular plot of ground 120′ diameter has a walk 10′ wide on the inside. Find the cost of constructing such a walk at 31 ½ cents per square yard.

(2) The interior of the plot referred to in No. 1 above is sodded at the rate of 6⅜ cents per square yard. Find the cost of the sodding.

(3) A boy turns a grindstone of 15″ radius 24 times per minute. If a chalk mark were made on the stone 4½″ from the outer edge, find in yards the distance it would travel in the course of 15 minutes' turning.

(4) The diameters of the fore and hind wheels of a carriage are respectively 4′ 4½″ and 5′ 3″. How far has the carriage gone when the hind wheel has made 708 revolutions less than the front one?

(5) A man trundling a wheelbarrow takes on an average 60 steps of 2' 6" each per minute. How many times does the wheel 14" in diameter turn in an hour?

(6) I have a plot of ground 28 feet square. Centrally in it I place a circular flower bed 28 feet in diameter. Find area I shall have to sod around the margin of the bed.

(7) The fore wheel of a carriage is 4' in diameter, while the hind one is 5'. Find difference in number of revolutions in a drive of 20 miles.

(8) A goat is tethered in a pasture lot with a rope 126 feet long. Find area she can graze over in square yards.

(9) A woman rolls her pastry for cakes into a square of 28 inches to a side. She uses a cake-cutter 4" in diameter. After cutting all the cakes she can, find the area of the pastry left.

(10) I have bunting 22" wide, with which I desire to cover the four posts of my verandah. The posts are 7" in diameter and 12' high. Find the cost of the bunting necessary at 40 cents per yard.

LXXII.—CYLINDERS.

(1) Find the cubic inches in each of the following cylinders :

(a) 3 in. radius, 6 in. height.
(b) 6 "   "   10 "   "
(c) 4 "   "   12 "   "
(d) 10 " diameter, 4 in.   "
(e) 12 "   "   8 "   "
(f) 14 "   "   10 "   "
(g) 44 " circumference, 8 in. height.
(h) 22 "   "   6 "   "
(i) 66 "   "   7 "   "

(2) Find the diameter of the following cylinders :
(a) 1232 cubic inches contents, and 8 in. height.
(b) 1540   "   "   " 10 "   "
(c) 1131⅔   "   "   " 10 "   "

(3) Find the radius of each of the following cylinders:
(a) contents 2425½ cubic inches, height 7 in.
(b)   "   231   "   "   6 "
(c)   "   905⅞   "   "   8 "

(4) Find the number of cubic inches in a wooden cylinder 18 in. high and 6 in. diameter.

(5) How many gallons in a cylindrical cistern 4 ft. diameter and 8 ft. deep (1 cubic ft. = 6¼ gals.)?

(6) How many bbls. of water in a cistern 6 ft. diameter and 14 ft. deep (1 cubic ft. = 6¼ gals.)?

(7) I have cylindrical oil cans 12 in. high and 6 in. diameter. How many of these could I fill from a cylindrical tank 36 in. diameter and 8 ft. long?

(8) Find the weight of a circular piece of lead 4 in. diameter and 6 in. thick, allowing lead to be 11½ times as heavy as water.

(9) A wooden cylinder 24 in. high and 8 in. diameter is reduced to a diameter of 6 in. Find the number of cubic inches thus removed.

(10) A circular piece of lead is 2 in. in thickness and 10 in. in diameter. A piece of 3 in. radius is cut from it. Find the weight of the circular ring left, allowing lead to weigh 10½ times as much as water.

LXXIII.—MISCELLANEOUS PROBLEMS.

4.

(1) Simplify $\left\{\dfrac{10\frac{1}{2} \text{ of } \frac{7\frac{3}{5}}{2}}{9\frac{7}{24} - 4\frac{5}{12}}\right\} \div \left\{\dfrac{4\frac{1}{2}}{9 + \frac{3}{3\frac{1}{3}}} + \dfrac{3\frac{1}{3} \times 8\frac{4}{5}}{2\frac{1}{3} \times 7\frac{5}{7}}\right\}$

(2) The longitude of Ottawa is 75° 45′ west, and that of Tokio, Japan, is 149° 15′ east. Find time at Tokio when it is 12 o'clock noon on Monday at Ottawa.

(3) My gain was at the rate of 20% when I sold tweed at $1.50 per yard. Find the gain on a sale of 875 yards made at $1.75 per yard.

(4) A can do a piece of work in ⅓ of a day, B could do the same work in 3/10 of a day. Find the time they would take to do .61 of the work.

(5) A certain sum of money amounts to $750 in 4 years, and to $843.75 in 7 years. Find the sum and the rate per cent.

(6) When 2460 lbs of hay costs $21.525, what is the price per ton?

(7) A farmer sows $6\frac{9}{11}$ oz. of wheat on 11 square yards of his wheat field. Find the value of the grain sown on a 10-acre field at $.73 per bushel.

(8) Silver is worth $1.17 per oz. Find the value of .179487 of a pound of the metal.

(9) The ice on a pond containing 5 acres is 11 inches thick. Allowing water to expand $\frac{1}{10}$ in freezing, find how many gallons of water the melted ice would give (1 cubic ft. = $6\frac{1}{4}$ gallons).

(10) A plate of copper 5 ft. 6 in. long, 3 ft. wide and $\frac{3}{4}$ in. thick is rolled into a sheet 4 ft. 6 in. wide and 6 ft. long. Find its thickness.

LXXIV.—MISCELLANEOUS PROBLEMS.

(1) Simplify $\left\{ \dfrac{.5 \times .006}{\frac{9}{16} \text{ of } \frac{4}{5} \times (\frac{1}{4})^2} \times \dfrac{\frac{1}{2} \text{ of } \frac{11}{16} \times (\frac{2}{3})^2}{1.6 \times .627} \right\}$

(2) The Avoir. pound contains 7000 Troy grains, and if 1920 sovereigns weigh 40 lbs. Troy, find the number of sovereigns coined from an ounce Avoir.

(3) The amount of a certain sum for 6 years at $3\frac{1}{2}\%$, simple interest, is $907.50. Find the principal.

(4)   Toronto, July 2, 1896.

Six months after date I promise to pay J. K. Smith Two Hundred and Seventy-Five Dollars with interest at eight per cent. Value received.

                              T. L. LOOMIS.

On Jan'y 5, 1897, $120 was paid. Find what sum will settle the debt on July 2, 1897.

(5) A cubical cistern is 5 feet deep. How many gallons will it contain? 1 gallon = 27, .274 cub. ins.

(6) A produce merchant exchanged $48\frac{2}{3}$ bush. of oats at $39\frac{2}{3}$ cents, and $13\frac{1}{4}$ bbls. of apples at $3.85 for butter at

$37\frac{1}{2}$ cents per pound. How many pounds of butter did he receive?

(7) Find the L.C.M. of 7, 9, 11, 14, 15, 22, 27, 35, 44, 45, 54.

(8) Add together 154.2125, .5421, .0001235, 741.206, .03, and 4567.0004.

(9) The difference between 82,610 and the product of two numbers is 70,300,000. One of the numbers is 9,402. Find the other.

(10) After spending $\frac{5}{13}$ of my money and $26, I found I had still $\frac{5}{13}$ of my money and $26 left. Find my money.

LXXV.—MISCELLANEOUS PROBLEMS.

(1) Simplify $\frac{4}{5}\left\{\dfrac{\frac{2}{3}\times\frac{3}{16}\times 1\frac{2}{3}\times\frac{21}{128}}{\frac{4}{21}\div\frac{7}{30}\times\frac{2}{8}\times 1\frac{13}{17}} \text{ of } \frac{8}{27}\times 27\frac{3}{4}\right\}\div\frac{3}{80}.$

(2) At what time between 6 and 7 o'clock will the hands of a watch be 12 minute spaces apart?

(3) Find the amount of the following bill in dollars and cents, the shilling being worth $24\frac{1}{3}$ cents : 115 yards Brussels carpet at 5s. 10d. per yard ; 95 yards Dutch stair at 2s. 7d.; 84 yards Kidderminster at 3s. 7d.; 72 yards drugget at 2s. 8d.; 10 doz. stair rods at 5s. 6d.

(4) Find the greatest number of which 853554 and 1128894 are multiples, and the least number of which 26, 33, 39 and 44 are divisors.

(5) What per cent. is lost by marking goods $16\frac{2}{3}$ per cent. above cost, and then giving a discount of $16\frac{2}{3}$ per cent. ?

(6) A and B had the same sum of money. A lost in the course of a year $225, while B increased his money by $\frac{1}{3}$ of his original sum. A's money is now $\frac{9}{16}$ of B's. Find the shares at first.

(7) A sells a horse which cost him $120 at a gain of 20 per cent. to B. B, in turn, sells to C at an advance of 15 per cent. on his cost. Had A sold directly to C, find A's rate of profit.

(8) A's farm contains 100.46875 acres, which lacks .28125 acres of being $\frac{1}{4}$ as large as B's. B's farm ex-

ceeds six times C's by 5.725 acres. Find the extent of the three farms.

(9) A farmer bought 50 animals, sheep, lambs and pigs, for $324. There are three times as many lambs as sheep, and twice as many pigs as lambs. A sheep costs twice as much as a lamb, and a lamb 1½ times as much as a pig. Find the numbers and prices of each.

(10) A purse and its contents are worth $10.50, and thirteen times the value of the purse is equal to twice the value of the contents. Find the respective values.

LXXVI.—MISCELLANEOUS PROBLEMS.

(1) Simplify $\left\{\frac{\frac{1}{2}-\frac{1}{3}}{\frac{1}{3}-\frac{1}{4}}\text{ of }\frac{\frac{1}{4}-\frac{1}{5}}{\frac{1}{5}-\frac{1}{6}}\text{ of }\frac{\frac{1}{6}-\frac{1}{7}}{\frac{1}{7}-\frac{1}{8}}\right\}$

(2) If $16\times10\times14\times40\times65\times18\times84\times45$ be divided by $50\times24\times70\times26\times7\times12$, find the quotient.

(3) If 6 apples and 7 apricots cost 4s. 4¼d. ; and 10 apples and 8 apricots cost 5s. 1·1½d., what is the cost of one of each.

(4) Find the G.C.M. and L.C.M. of 49.383 and .142569.

(5) Divide $3975 among A, B, C, and D so that B may have $23 more than A ; C $45 more than A and B together, and D $29 less than B and C together.

(6) 60 men can do a piece of work in 24 days. After 8 days' work 12 of the men leave. Find length of time necessary to finish the work.

(7) The product of two numbers is 31671 ; their G.C.M. is 9. Find the L.C.M.

(8) A dealer sells 210 lbs. tea for $142.50. Part of it was worth 73 cents per lb., and the remainder 61 cents per lb. Find the number of pounds of each.

(9) Divide $59.13 among A, B, and C, giving A $\frac{3}{4}$ as much as B, and giving B only $\frac{7}{8}$ of C's share.

(10) (a) Make out the following bill in good commercial form, supplying names, date, and place :

5 kegs 3-inch nails, 75 lbs. each, at 4½ cents per lb.
28 pkgs. copper rivets, 1 lb. 4 oz. each, at 12½ cents per lb.
48 lbs. steel ⅝ inch bolts at $6.25 per cwt.

13 doz. table knives and forks, at $3.50 per doz.

2 kegs, 62 lbs. each, gunpowder, at 30 cents per lb.

6 barrels millers' lubricant, 31½ gals. each, at 25 cents per gal.

(b) The customer pays cash for the bill, and is allowed a discount of 10%. Receipt the bill, you signing for the proprietor.

LXXVII.—MISCELLANEOUS PROBLEMS.

(1) Simplify $\dfrac{1.5}{.075} \times \dfrac{3.25}{1\frac{1}{2}} + \dfrac{1.875}{2.1} \times \dfrac{3.5}{3.75}$

(2) A train travels 19 miles in ?? minutes, and a pigeon flies at a uniform rate of 12 miles in 6½ minutes. Express as a decimal the rate of the train as compared with the rate of the pigeon.

(3) A coal dealer bought a quantity of coal for $484.50; he sold 72 tons at $5.25 per ton, and the remainder at 31 cents per cwt. He gained $153.90 on his bargain. How many tons did he buy?

(4) The product of three numbers is 8937992; the third is double of the second, and the sum of the second and the third is 906. Find the first.

(5) Add together 4840, 478 and 982; divide the sum by 140; from the quotient subtract 18, and multiply the remainder by 409.

(6) A dealer sold 103 yards of silk and velvet for $105.03. The silk sold for $1.15, and the velvet for $.93. Find the number of yards of each.

(7) A grocer bought 6 cwt. of sugar for $52.10; he set aside 65 lbs. for his own use, and sold the rest so as to make a profit of 1⅛ cents per pound on the whole quantity. How much per pound did he sell it for?

(8) I bought a bush farm, 180 rods by 96 rods, at $12.50 per acre. The clearing cost $14.75 per acre, and I paid $1.35 per rod for enclosing the whole farm. The wood was sold for $1160, and the ashes realized $17.20. Find the net cost per acre.

(9) A note of $360 drawn April 20, 1896, is paid on July 2, 1897, with interest at 7½ per cent. per annum. Find the amount paid.

(10) Express as a fraction of an acre the sum of the following : ½ of ⅝ of 1⅝ of an acre ; ⅜ of 1⅜ of ⅔⅜ of 100 sq. rods, and 1⅘ of 2½ times 605 sq. yards.

LXXVIII.—MISCELLANEOUS PROBLEMS.

(1) An old lady on counting her eggs found she had an exact number of dozens, but when she counted them by 5's or 7's she always had 3 over. How many eggs had she ?

(2) A merchant received a case of goods invoiced as follows : 12 pieces silk, 48 yards each, at 5s. 3d. per yd. ; 15 pieces cotton, 60 yards each, at 6¼d. per yd. ; 20 pieces cotton, 56 yards each, at 4¾d. per yd. ; 14 pieces linen, 40 yards each, at 1s. 3½d. per yd. Supposing the shilling to be worth 24⅓ cents, find the amount of the above bill of goods.

(3) A and B together can do a piece of work in ¾ of a day, B and C in ⁹⁄₁₀ of a day, and A and C in 1⅘ of a day. In what time could all working together do the work ?

(4) Find the G.C.M. of 68590142 and 85044059.

(5) For a voyage of 17 weeks a ship takes provisions to the amount of 17 tons, 12 cwt., 1 qr., 6 lbs. 10 ozs. Supposing there are 73 men aboard, how much may be allowed each man per day ?

(6) A dealer bought 8 carloads of lumber each containing 9870 feet at $13.50 per M. He retailed it at $1.43 per 100 feet. Find gain on the whole lot.

(7) If 4 men *or* 6 boys can do a piece of work in 8 days, how long will it take 8 men *and* 4 boys to do such a piece of work ?

(8) Reduce 75.0125 cwts. to ounces.

(9) A horse worth $170 and 3 cows worth $36 each were exchanged for 14 calves and $82. Find the value of a calf.

\# 2.10
.70 cts

(10) Divide $82.60 among 27 men and 37 boys, so that each man may have 3 times as much as each boy.

LXXIX.—MISCELLANEOUS PROBLEMS.

a) 1 lb feathers
b) 42½ grains

(1) a. Which is the heavier a lb. of feathers or a lb. of gold? b. By how much does an ounce of gold exceed in weight an ounce of feathers?

\# 2128.

(2) What sum will amount to $2646.70 in 3¼ years at 7½ per cent.?

answer not given

(3) How can you tell without actual division whether a number is divisible, (a) by 2; (b) by 3; (c) by 4; (d) by 5; (e) by 9; (f) by 10?

71 119/176 miles

(4) A man can cover a 220 yard race in 22 seconds. At that rate how far would a bicycle rider go in 3 hrs., 30 min., 15 secs.?

2560 acres

(5) A map is drawn to a scale of ½ an inch to a mile. Find the area represented by a square inch of the map.

66⅔%

(6) A druggist buys borax for 5 cents per lb., and sells 3 lbs. for 25 cents. Find rate of profit.

13⅓ cts.

(7) By selling 12 lbs. sugar for $1, a profit of 25 per cent. is made. Find what amount of profit a grocer makes by selling 13 lbs. for $1.

.000578+ in

(8) A cube of silver of one inch side is rolled into a sheet of 4 ft. by 3 ft. Find its thickness correct to 6 places of decimals.

\#177 7/9.

(9) A dealer gives 11 lbs. 4 oz. sugar for $1. At that rate, find his proceeds from the sale of 1 ton.

192 cubic feet

(10) A class-room 32 ft. long, 24 ft. wide and 12 ft. high has accommodation for 48 pupils. How much air space is allowed for each?

LXXX.—MISCELLANEOUS PROBLEMS.

1 89/120

(1) Simplify $\dfrac{2\frac{1}{2}}{3\frac{1}{4}} + \dfrac{3\frac{3}{8} + 4\frac{1}{2}}{9} + \dfrac{5}{6}$ of $\dfrac{3}{11} \times \dfrac{22}{25}$

1 11/1 d.

(2) Find the difference between .428571 of a guinea and ⅕ of a sovereign.

\# 130.90

(3) Find the smallest sum of money with which I

could buy chickens at 34 cents, ducks at 85 cents, geese at $1.19, and turkeys at $1.87.

(4) By selling hats at $2.21 each we make a gain of .625 of cost. Find selling price per doz. to make a gain of 50 per cent.

(5) Divide $258 among 12 men, 15 women and 20 boys, giving a man $3 for every $2 paid a woman, while a boy was paid at just half the rate given a woman.

(6) How many cords of wood on a lot 120 feet wide and 180 feet long, and piled 10 feet high, allowing a roadway 12 feet wide through the middle run. ng the long way?

(7) The population of India is roughly placed at 280,000,000. Allowing each person the 30 inches allowed a soldier, what length of line would they form if placed side by side?

(8) A man borrows $500 for 3 years at a certain rate, and $400 for 2½ years at 1½ per cent. more, both at simple interest. His total interest charge is $177½. Find the rates.

(9) What will it cost to carpet a room 18 feet by 15¾ feet, strips laid lengthwise, at $1.20 per yard for 27 inch carpet?

(10) A dealer bought 240 bbls. of flour, and sold ⅓ of it at a gain of 33 per cent., 80 bbls. he sold at a gain of 25 per cent., and the remainder was disposed of at an advance of 40 per cent. on cost. His total gain was $354. Find cost price per bbl.

LXXXI.—MISCELLANEOUS PROBLEMS.

(1) In walking 2 miles, A takes 4224 steps, whereas B, in walking the same distance, will require 3520 steps. Find difference in the length of their steps.

(2) In what time will $3850 at 4½ per cent. amount to $4369.75?

(3) A block of ice is 3 ft. by 4 ft. by 6 ft. What quantity of water, in gallons, will it furnish when melted, water expanding 10 per cent. in freezing?

(4) $\frac{2}{3}$ of A's money $= \frac{3}{4}$ of B's, and $\frac{2}{3}$ of B's $= \frac{3}{4}$ of C's. Together they have $899. Find share of each.

(5) In an election contest A's vote is to B's as 5 to 7. B is elected by a majority of 192. If the total names on the list were 1260, how many did not vote?

(6) A mixture of wine and water, in which there is 120 gallons of wine, is worth $1.00 per gallon. If the wine be $1.25 per gallon, how much water is there in the mixture?

(7) At what time after six o'clock are the hour and minute hands first 10 minute spaces apart?

(8) $\frac{4}{5}$ of a quantity of goods was sold for what $\frac{3}{4}$ of the goods cost. Find the rate of gain.

(9) Divide $103.75 among three persons, so the first has $10 less than the second, but has double the third man.

(10) I have $30000 invested in mortgages, which yield an income of 6 per cent., but after paying an income tax on the whole income, I find I have for my own use $1771.20. Find the rate charged.

LXXXII.—MISCELLANEOUS PROBLEMS.

(1) Simplify $\dfrac{6\frac{1}{4}+5\frac{1}{3}+1\frac{7}{12}-\frac{3}{8}}{15\frac{1}{2}\div 4\frac{1}{3}-\frac{2\frac{3}{4}}{3\frac{3}{8}}}\div\dfrac{\frac{7}{78}+\frac{9}{13}}{\frac{1}{7}\times\frac{3}{8}\times\frac{2}{3}\times 2\frac{2}{7}}$

(2) When the dealer's gain was $14\frac{3}{4}$ per cent. of the selling price his gain was $378. Find the sum for which he sold the goods.

(3) 15 geese and 12 turkeys cost $22.20. The turkeys were worth 50 cents each more than the geese. Find the value of 8 geese and 5 turkeys.

(4) Divide $144 among A, B, and C, giving A $\frac{3}{4}$ of B's share, and B $\frac{4}{5}$ of C's share.

*(5) A capitalist has $67,718 which he divides into 2 shares, so that the interest on the 1st sum for 8 years at 5 per cent. is equal to the interest on the 2nd sum for 5 years at 6 per cent., simple interest in both cases. Find the two sums.

*(6) Resolve 1801800 and 540540 into their prime

factors ; from these factors find their L.C.M and G.C.M. and divide the former by the latter.

(7) The wages of A alone for 36 days will pay the wages of A and B together for $16\frac{14}{17}$ days. For how long would the same sum pay the wages of B alone ?

(8) A Montreal commission merchant sold a consignment of 240 hogs, average weight 180 lbs., for $4.75 per cwt. Find his commission at $2\frac{1}{2}$ per cent.

(9) A grass plot having its sides in the ratio of 2 to 3, contains 2400 square yards. Find the cost of an ornamental fence round it, costing 53 cents per foot.

(10) What is the total cost of the following : 108 eggs at 13 cents per doz. ; 128 lbs. pork at $6.25 per cwt. ; 1650 lbs. bran at $12 per ton ; 6060 lbs. wheat at 87 cents per bushel ; 375 lbs. sugar at 20 lbs. for $1 ; 963 lbs. oats at 68 cents per bushel ?

LXXXIII.—MISCELLANEOUS PROBLEMS.

(1) Simplify $\dfrac{\dfrac{6\frac{1}{4}}{22} \text{ of } \dfrac{12}{64} \div \dfrac{9}{22} \times 1\frac{53}{171}}{.3\dot{8} \times .27}$.

(2) A and B can do a piece of work in $4\frac{4}{5}$ days when working together ; B can do $\frac{2}{3}$ of the work in 6 days. Find A's daily wages if $18 were paid for the whole job.

(3) In an 80 gallon mixture of wine and water the wine was $\frac{6}{8}$ of the whole. How much water added will make the mixture half-and-half ?

(4) A sailor had a rope 140 feet long, which he cut so that $\frac{2}{3}$ of the shorter piece is just the length of $\frac{3}{10}$ of the longer. Find the lengths.

(5) A farm worth $7200 is rated at $\frac{2}{3}$ of its value. Find Mr. A's taxes when we know the rate to be $11\frac{1}{2}$ mills on the dollar.

(6) Bought $\frac{1}{4}$ of $4\frac{1}{3}$ cords of wood for $\frac{1}{4}$ of $\frac{1}{3}$ of $30 ; find value of 26 cords at same price.

(7) If we increase a quantity by $\frac{1}{2}$ of itself, and that result by $\frac{1}{3}$ of itself, what part of the original number shall we now have ?
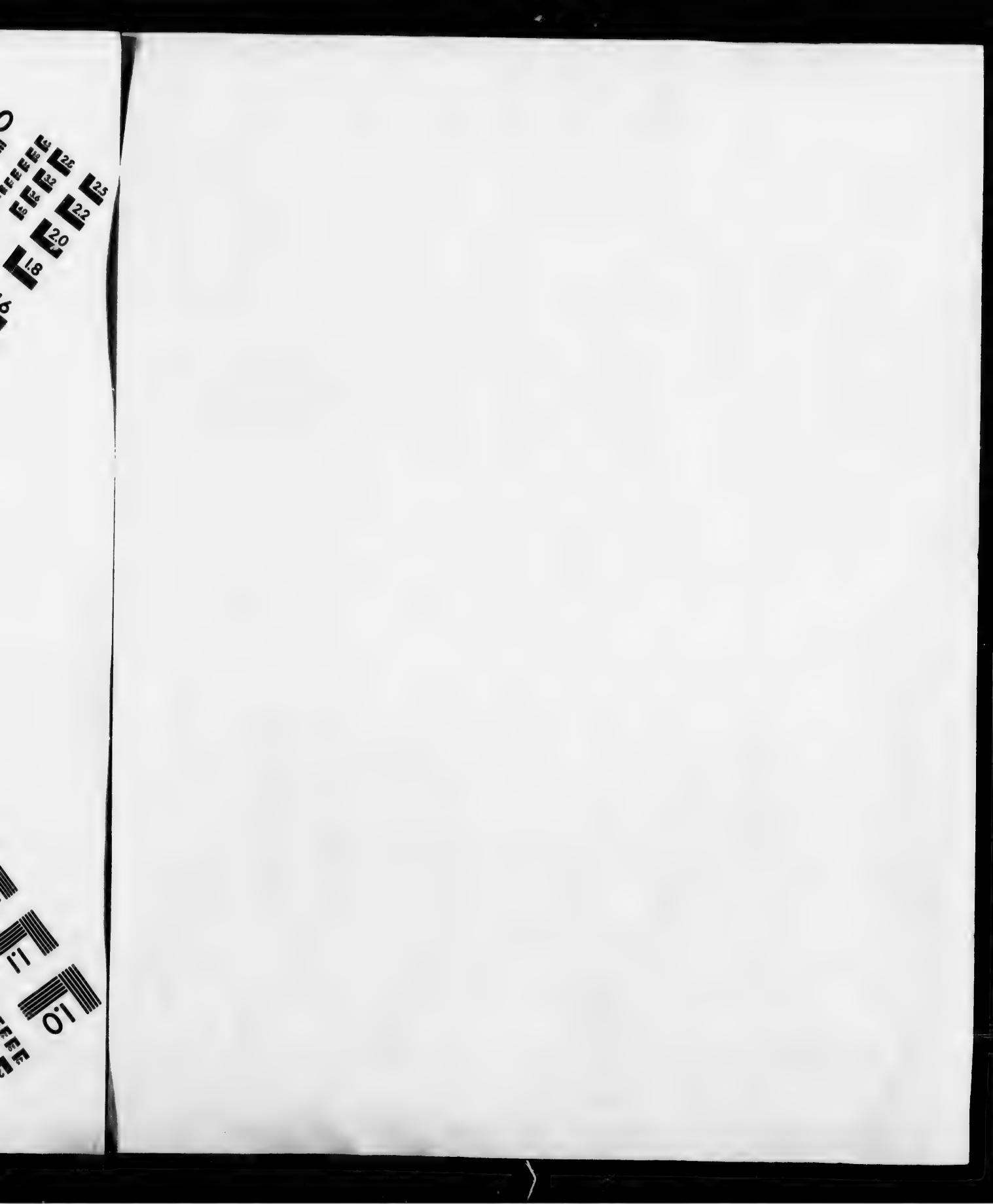
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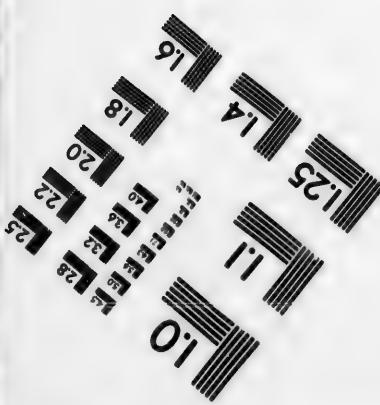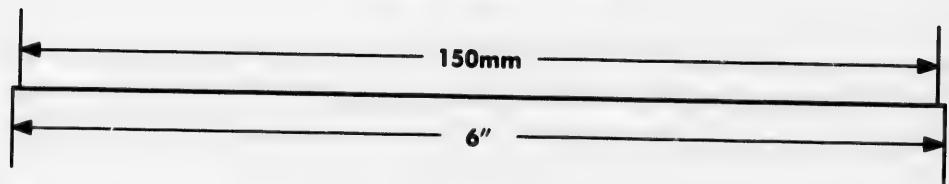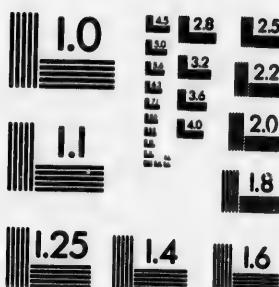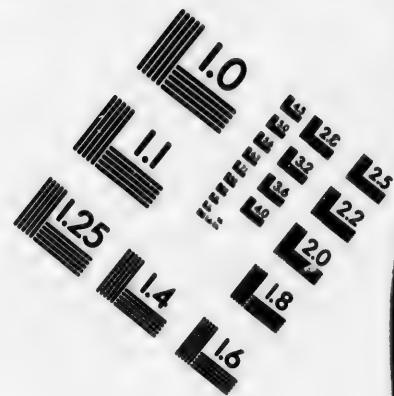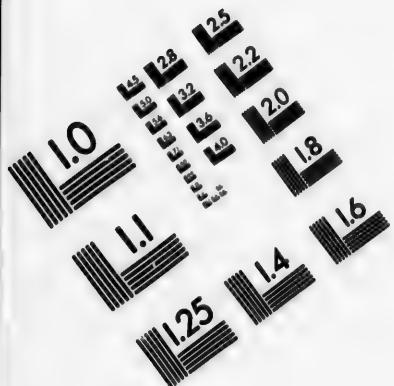
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6"

LXXXIV.—ENTRANCE, 1895.

(1) (a) Make out the following bill neatly, accurately and in proper form. All fractions are to be retained: John Wilson bought from you to-day: 7½ lbs. cheese, at 12½ cents per lb.; 6¼ lbs. butter, at 23 cents per lb.; 2½ lbs. tea, at 55 cents per lb.; 27 lbs. sugar, at $1.00 for 12 lbs. (b) He paid you cash, and you allowed him a discount of 5 per cent. (c) Receipt the account.

(2) Find the simple interest on $912.50 at 8 per cent. from 13th February, 1893, to 19th December, 1894. (1 year = 365 days.)

(3) A farmer sold a load of barley weighing 2712 lbs., when barley was 40 cents per bushel. In weighing the grain, the dealer made a mistake and took it as rye, paying for it at 49 cents per bushel. How much did the farmer gain or lose by the result?

(4) A cord of wood and 100 bushels of grain fill equal spaces. A cubic bin whose edge is 12 feet contains 45900 lbs. of grain. Find the weight of one bushel of this grain.

(5) Find the expense of sodding a plot of ground which is 40 yards long and 100 feet wide, with sods each a yard in length and a foot in breadth, the sods, when laid, costing 75 cents per hundred.

(6) A can walk 3½ miles in 50 minutes, and B can walk 2¼ miles in 36 minutes. How many yards will A be ahead of B when A has gone 6 miles, if they start together?

(7) A can do a piece of work in ⅜ of a day, and B in ½ of a day. In what time can both together do it? If $1.40 is paid for the work, how much should A receive?

(8) (a) Simplify $3\frac{1}{2} + \frac{2\frac{1}{2} - \frac{1}{8}}{2\frac{1}{2} + \frac{1}{8}} - \frac{1}{10}$ of $3\frac{1}{3} - \frac{7}{8}$, and

(b) Divide 6 by .000725 correct to four decimal places.

LXXXV.—ENTRANCE, 1896.

(1) How many boxes, each holding ¾ of a quart, will be required to hold 12 bushels, 3 pk., 1 gal., 2 qt. of strawberries?

(2) a. Reduce to its simplest form .

$$\frac{1-\frac{2}{3}\text{ of }\frac{3}{4}}{1-\frac{1}{3}\times\frac{1}{4}}\times\frac{\frac{3}{4}+\frac{3}{8}}{1\frac{1}{8}}\div\frac{6}{8}$$

b. Simplify the following without reducing to vulgar fractions : .0476 × 4.2 ÷ .014.

(3)   Toronto, Jan. 8th, 1894.

One year after date, I promise to pay Gilroy & Wiseman, or order, one thousand dollars, with interest at six per cent. Value received.   JOHN WILSON.

This note was paid in full on Jan. 25th, 1895. Find amount.

(4) At $15.00 per M., board measure, what will be the cost of 2-inch plank for a 4-foot sidewalk, half-a-mile long ?

(5) A man earns $280 in 2½ months. If he spend in 4½ months what he earns in 3½ months, how much will he save in a year ?

(6) An apple buyer paid $198.00 for 126 bbls. of apples consisting of Northern Spies and Wagners ; there were ⅞ as many Spies as Wagners, and the latter costing 25 cents per bbl. less than the former. Find the cost of each kind per barrel.

(7) On Monday, a grain dealer bought 932 bushels of oats at 21 cents per bushel ; on Tuesday, 680 bushels at 20 cents ; Wednesday 836 bushels at 20 cents ; Thursday 675 bushels at 21 cents ; Friday 765 bushels at 22 cents ; Saturday 751 bushels at 22 cents. He then sold the entire week's purchase at 2 cents per bushel above the average cost per bushel. Find (a) The average cost per bushel. (b) His whole gain. (c) His gain per cent.

(8) Find the sum of the following numbers :
(i)   Nine millions, five hundred and three.
(ii)   Eight hundred thousand and four.
(iii) Five hundred and seventy millions and two.
(iv) Three hundred and fifty-three thousand.
(v)   Two thousand and four.
(vi) Fifty-eight thousand and fifty-eight.
(vii) Four millions, fifty thousand, three hundred and nine.

(viii) Three hundred and six millions, forty thousand and ten.

Give the result both in figures and in words.

LXXXVI.—ENTRANCE, 1897.

96 mi
80 rods
(1) The equatorial diameter of the earth is 13948880 yards, and the polar diameter 2527760 rods. By how many miles and rods is the equatorial diameter greater than the polar?

13½ lbs
(2) If $2.06¼ buy 7½ lbs. of tea, how many lbs. can be bought for $3.71¼?

$97.88½
(3) Find the simple interest on $1387 at 5½ per cent. per annum from March 21st, 1896, to June 29th, 1897.

385 lbs.
(4) A farmer sold a load of four-foot wood, 7 ft. long by 4 ft. high, to a grocer, at the rate of $3.60 per cord, receiving in exchange 3 lbs. tea at 37½ cents per lb.; 5 lbs. rice at 5½ cents per lb., and the remainder of the price in granulated sugar at the rate of 22 lbs. for one dollar. How many lbs. of sugar did he receive?

$19.40
(5) A produce dealer bought 833 lbs. oats at 24 cents per bushel; 1572 lbs. barley at 36 cents per bushel; 1995 lbs. peas at 44 cents per bushel. He mixed them, and had the mixture ground into feed without loss of weight at a cost of 5 cents per cwt., and then retailed the feed at $ per ton. Find his entire gain.

$41.10
(6) Find the cost of gilding the entire outside surface of a covered box, 3 ft. long, 2 ft. 6 in. wide, and 1 ft. 9 in. deep, at $1.20 per square foot.

$3.50
(7) A retail dealer sold a suit of clothes for $29.40, making a profit of 20 per cent. If the cloth and trimmings cost six times as much as the making, find how much the tailor who made the suit received.

13
147.32
18933.26
1 11⁄54
(8) (a) Find the G.C.M. of 1573 and 689.
(b) Divide .766064 by .0052.
(c) Multiply .0362 by 5.23.
(d) Simplify ½ of ¾ − ¼ × ⅔ + ½ ÷ ⅗.

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